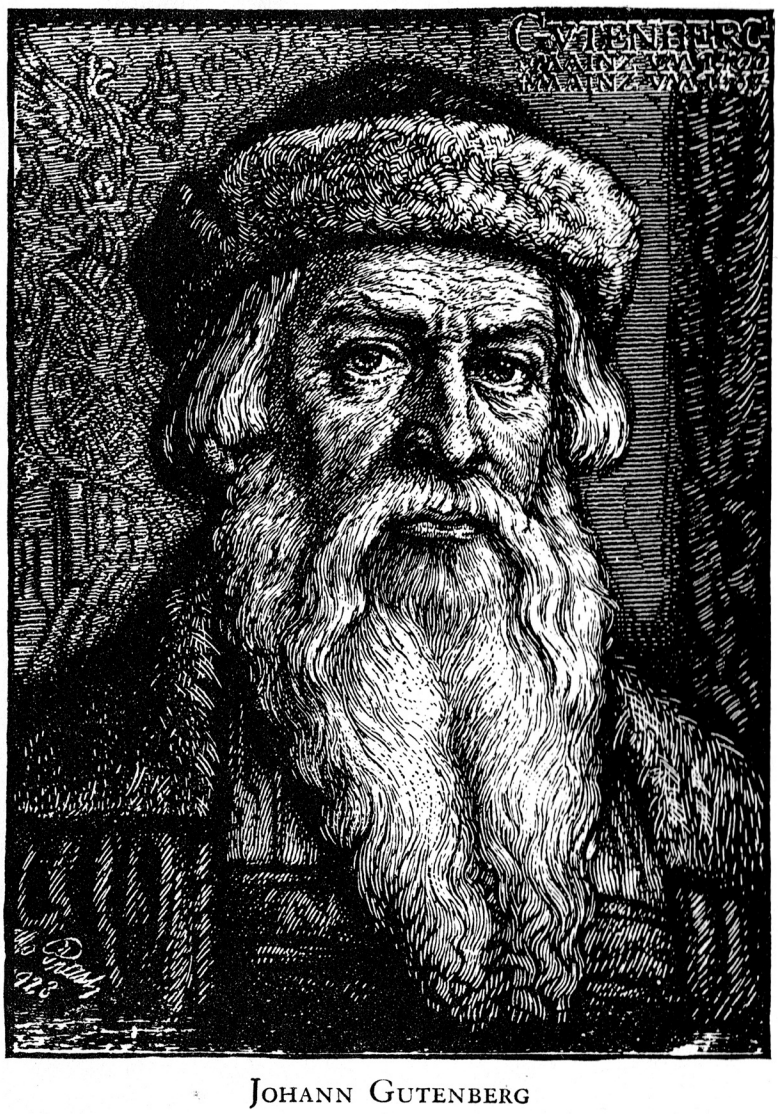
HAND COMPOSITION



JOHANN GUTENBERG

From a wood engraving
by the German artist, Otto Prast.

HAND COMPOSITION

A TREATISE ON THE TRADE AND PRACTICE OF THE COMPOSITOR AND PRINTER

. . .

Including
An Historical Introduction

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SECOND PRINTING (OFFSET), 1947

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PREFACE

In recent years very few books have been written which deal exhaustively and clearly with HAND COMPOSITION and PRINTING as a trade and as an art. Many excellent technical articles on printing processes in general have appeared in the trade magazines and in special pamphlets. To these I am partly indebted for inspiration in writing and compiling the material for this book on Hand Composition. All practical suggestions dealing with hand composition and related operations have been "tried out," and those that have proved best for their specific purpose have been developed and embodied within this volume.

During my twenty years of experience as a tradesman, and as a teacher of printing, and especially as instructor in hand composition and related subjects, and during my travels in the United States and Europe, I have had ample opportunity to practice and observe the principles which I have expounded in this book. It was not written within a few months or years, but it is the culmination of many years of work, and includes my lectures, notes, manuscripts, pamphlets, and records of research in printing.

The information contained in the historical chapters, especially that in Chapters I, II, and III, was obtained during the three summers which I spent in Europe, through personal contact with men who possess the facts, and by reading and studying the books and articles of the foreign writers on these subjects.

In the preparation of the manuscript, and in obtaining illustrations for my book, I acknowledge the advice, information, and help which I have received from the following persons:

Mr. D. B. Updike, of the Merrymount Press; Mr. J. W. Phinney, Boston branch manager, and Mr. H. L. Bullen, librarian of the American Type Founders Company; Mr. H. L. Gage, of the Bartlett Orr Press; Mr. H. P. Porter, of the Oxford-Print; Mr. A. F. Mackay, Mr. G. F. Trenholm, and Dr. F. W. Hamilton, of Boston; Herr Gustav Mori, historian, Schriftgiesserei D. Stempel, Frankfurt, Germany; Dr. Alois Ruppel, director, and Dr. Adolph Tronnier, of the Gutenberg Museum and Library, Mainz, Germany; Dr. Maurits Sabbe, director of the Plan-

tin-Moretus Museum, Antwerp, Belgium; Dr. Isak Collijn, administrator-general of the Royal Library of Stockholm, Sweden; Dr. Georg Leidinger, division of manuscripts, Staats-Bibliothek, and Dr. Willy Wiegand, of the Bremer Presse, at Munich, Germany; Mr. Jan van Krimpen, of Joh. Enschedé en Zonen, Haarlem; Mr. H. K. Rossiter, curator of the print department, and Mr. Dowse Dunham, of the department of Egyptian art, Museum of Fine Arts at Boston.

The information contained in Chapter XVIII, dealing with the modern manufacture of printing papers, was taken to a great extent from publications of the Hammermill Paper Company, Champion Coated Paper Company, Dill & Collins Company, S. D. Warren Company, American Writing Paper Company, Eastern Manufacturing Company, Canson & Montgolfier, and Tileston & Hollingsworth Company, and I give due credit for this source of information.

HUGO JAHN.

Boston, May, 1930.

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INTRODUCTION

The trade and art of printing on paper may be divided, according to the processes of production, into three distinct groups or branches: (*a*) Flat-surface or planographic printing, such as is represented by lithographic, offset, and photo-gelatin printing. (*b*) Depressed-surface or intaglio printing, such as the steelplate, copperplate, photogravure, and rotagravure printing. (*c*) Relief-surface printing, generally called typographic or letter-press printing. The typographic processes are the most universally used of all processes, and hand composition is one of the major divisions of these processes. Since hand composition is a basic and fundamental operation necessary for the production of a great deal of the finest printed matter, it is quite appropriate that "Hand Composition" should be the title selected for this book on the trade and the practice of the compositor and the printer.

"Hand Composition" is intended to be a helpful guide for all printers' apprentices; it may be used as a text and reference book for students and teachers of printing, and for compositors and printers in general. For the layman it is of interest for its historical contents. This book does not contain lists of questions, but several of the chapters include material which can be and has been successfully used for typographic exercises. Those paragraphs which are marked *Instruction* contain directions for the performance of mental and mechanical operations and should be followed out by the student. The careful study of "Hand Composition" will enable the compositor or student to answer almost any question which may arise in his mind relating to the graphic arts industry, and also aid him in the performance of all the mechanical operations employed in the production of printed matter.

After Chapters I, II, and III of this book, which are largely historical, the arrangement of the material for the technical chapters, and their numbering, have been done with a view to placing them in a logical and progressive order. The fourth chapter, dealing with *type cases,* contains the information which the student of printing requires first, so that he may pursue his studies systematically. The fifth chapter, dealing with *compositors' tools,* gives the information that is in proper sequence to

that contained in the preceding chapter. The chapters then following inform the student, step by step, of all that is essential in the study and practice of the compositor's trade and art.

After studying "Hand Composition," the student of printing is urged to obtain additional knowledge of the graphic arts in general by reading, with regularity, at least one of the leading trade magazines, like the *Inland Printer,* and *American Printer.* A great deal of valuable information pertaining to the various branches of composition is constantly being printed in trade papers, but much of this material does not appear in book form until many years later.

While discussing the importance of reading and studying, it is advisable to impress very firmly upon the mind of the student the equal importance of learning to write well. Next to possessing knowledge, the ability to impart this knowledge to someone else, through the spoken or written word, is of the greatest importance. In fact, we are judged by our employers and associates largely by what we say or what we write. Either we are educated or uneducated—informed or uninformed—merely intelligent or even intellectual—depending upon what we have to say or write.

Writing, then, must be a part of everyone's plan of study.

It is said that the writing of stories, fiction, poetry, etc. cannot be taught, and that nobody taught our greatest writers how to write. That may be true. It is not the intention to make novelists or poets of those who read this book. But every young man of fair intelligence may be helped and inspired if he has a desire to write better English than he is using. Every student of printing should be able to express his thoughts in clear, understandable English, and be able to state facts as they are.

He may begin by writing a few lines every day in a blank book. The next day, after reading them over, he should try to improve the phraseology. For, good writing, as many great authorities have said, is largely re-writing.

The student may ask, "What shall I write about?"

"Write about anything that may be of interest to you. Select a subject that is related to printing or the graphic arts in general; write a definition of one of the technical terms used in printing (of which there are over a thousand), and then consult some reference book, a list of which is printed at the end of this volume, in order to obtain additional information about your subject. But whatever you write, write it accurately, clearly and precisely."

It is advisable to collect specimens of good printing and study and analyze them carefully. The young printer should visit exhibitions of printing and of the closely related industries; attend lectures on art in general and especially on the art of printing; go to museums and libraries; read the most important books on printing, both old and new, that are to be found in the libraries; compare the masterpieces of early printing with the best work of the present time. All this will broaden his knowledge and help him to advance rapidly in his trade and art. The printer should have some knowledge of all the industries and of business, because he must print for all.

The student should not fail to avail himself of every opportunity to visit a paper-mill, an ink-factory, an electrotype foundry, the composing room of a modern newspaper, a book-publishing and a photo-engraving establishment. This will give him a great deal of interesting and useful information.

HAND COMPOSITION

CHAPTER I

PRE-TYPOGRAPHIC WRITING SYMBOLS, MATERIALS, AND BOOKS

The history of printing, in a broad sense, begins almost contemporaneously with the history of civilization. Printing is a form of symbolic writing, but undoubtedly both the graphic representation of an object, by means of *drawing* or incising upon a more or less flat surface, and the so-called *picture-writing* preceded the making of symbols. We may therefore well devote a few pages to the consideration and discussion of the known *pre-typographic writing symbols* which were the forerunners of our modern alphabet and subsequently of our letters and printing types. In an attempt to trace the invention and development of the Roman or Latin alphabet we must go back at least 5000 years.

The earliest symbols used in the preservation of records were the hieroglyphics or picture-writings of the people of the first Egyptian dynasty (about 3100 B.C.), under King Menés. They were inscribed on stone cylinders. The incised cylinders were used as seals, and also to delegate authority to an officer of the king.

A good specimen of hieroglyphics is shown in Figure 1. This illustration, much reduced in size, is reproduced from a drawing printed in Lepsius' *Denkmäler,* Vol. II, Pl. 100-b. The original pictures or symbols, two of which (in the 3d and 5th columns) are partly effaced, are from the inscription on the tomb of Iy and Nofret, at Saqqara, Egypt, who lived during the fourth dynasty, about 3000 B.C. The hieroglyphic text in this specimen reads down each column, beginning at the left. The Egyptian monument engravers did not, however, always follow the same order of arrangement in placing records on stone, nor was there a uniform system in writing these symbols. They frequently read from right to left, and from the bottom upward.

The Cuneiform Characters

Another style of ancient writing characters of which we have a clear record are the Assyrio-Babylonian cuneiform characters. They were

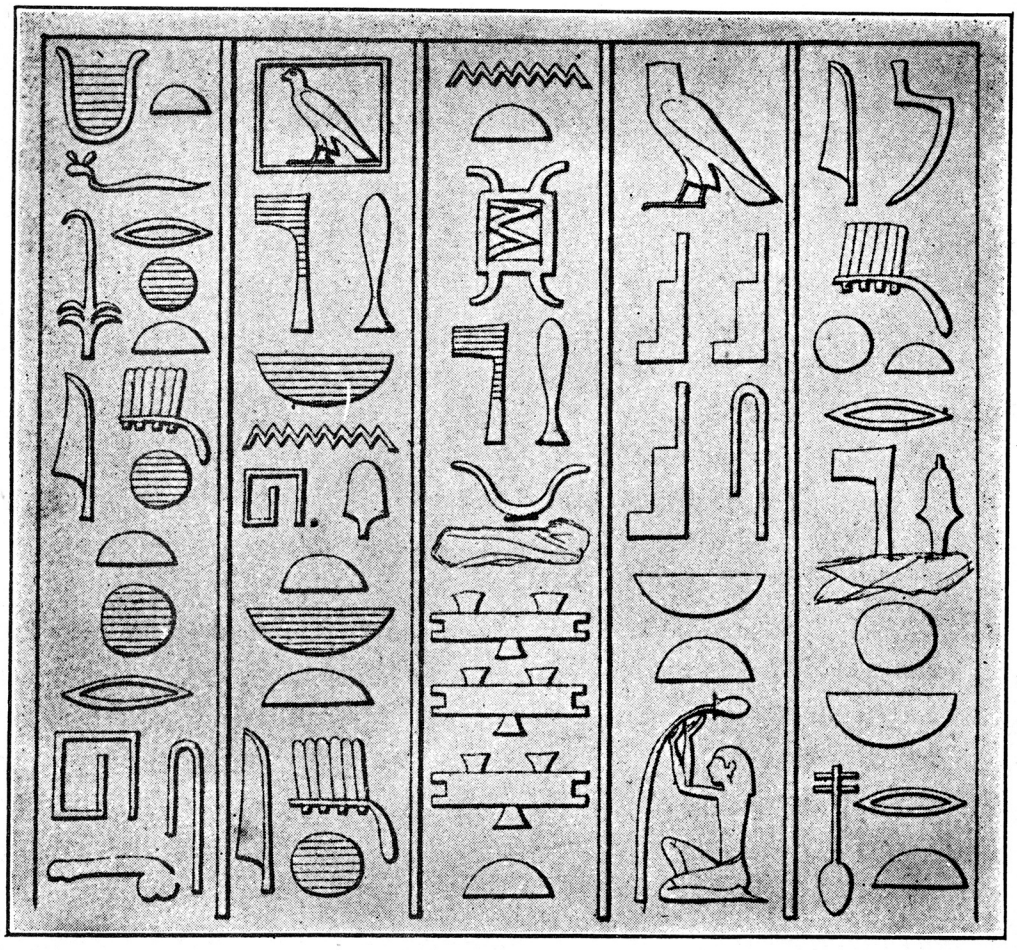


FIGURE 1

The Egyptian hieroglyphics. Translation of symbols—Column 1: His Wife, member of the King's clan, honored before her husband; (2) Priestess of Hathor, Lady of the Sycamore, Mistress of Honor; (3) Priestess of Neith, Opener of Roads; (4) in her every pure place; (5) honored before the Great God every day. NOFRET.

wedge-shaped or arrow-headed in form, and this shape gave them their name. These symbols were scratched or incised in soft clay or potter's earth, which was afterward baked or dried in the sun, to harden the substance. During excavation many ancient records have thus been found on tablets. Even parts of entire libraries on clay cylinders or tablets have been recovered. The ancient Babylonians, Persians, and Assyrians in Central Asia had several styles of cuneiform characters, and they may be dated from 3000 to 2000 B.C.

The Rosetta Stone

A notable specimen of pre-typographic writing is the Rosetta stone, found in Rosetta, Egypt, in 1798 A.D., and deciphered by the French

archeologist, M. Champollion. The stone is of black basalt, 2½ by 3½ feet in dimension, and about a foot thick. It contains, at the top, fourteen lines of hieroglyphics (*hiero*=sacred, divine; *glyphic*=engraving); thirty-two lines of demotic characters in the middle; and at the bottom, fifty-four lines of Greek characters. It was erected by the General Council of Egyptian priests in 196 B.C. in honor of Ptolemy V, Epiphanés, king of all Egypt. The inscription on the stone, in the three different characters—in hieroglyphics, the priests' writing; in demotic or common (business) letters, the people's writing; and in Greek characters—gave the key, through the Greek, to the deciphering of the Egyptian symbols, which were practically unreadable to the scholars of Europe before that time. The Rosetta stone is preserved in the British Museum, London.

The Runic Writing Symbols

Runic inscriptions and writing first made their appearance in Denmark, about 200 A.D. The word rune comes from *runa,* secret. The runic characters were the first writing symbols of the Germanic tribes and were developed from early Greek and a few Latin signs. There were several styles of symbols and alphabets—Germanic, Nordic, and Anglo-Saxon, and these were made by the different tribes from left to right,

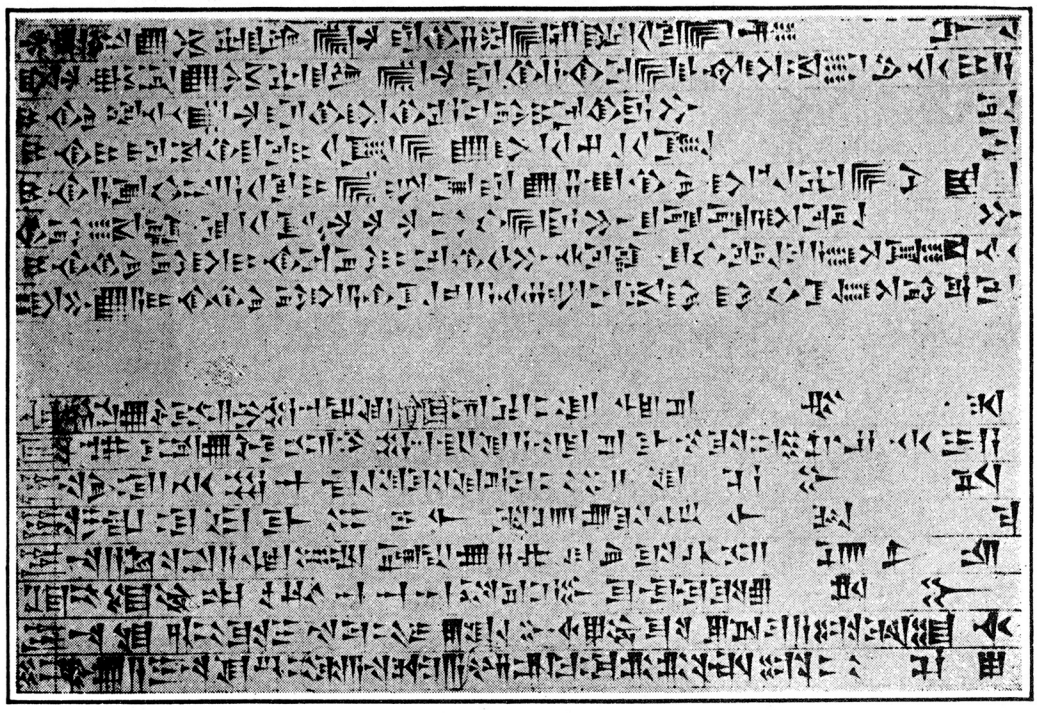


FIGURE 2

The Assyrio-Babylonian cuneiform characters.

and sometimes alternately, in one direction and then in the other. Originally the runic alphabet consisted of twenty-four signs, which grew to

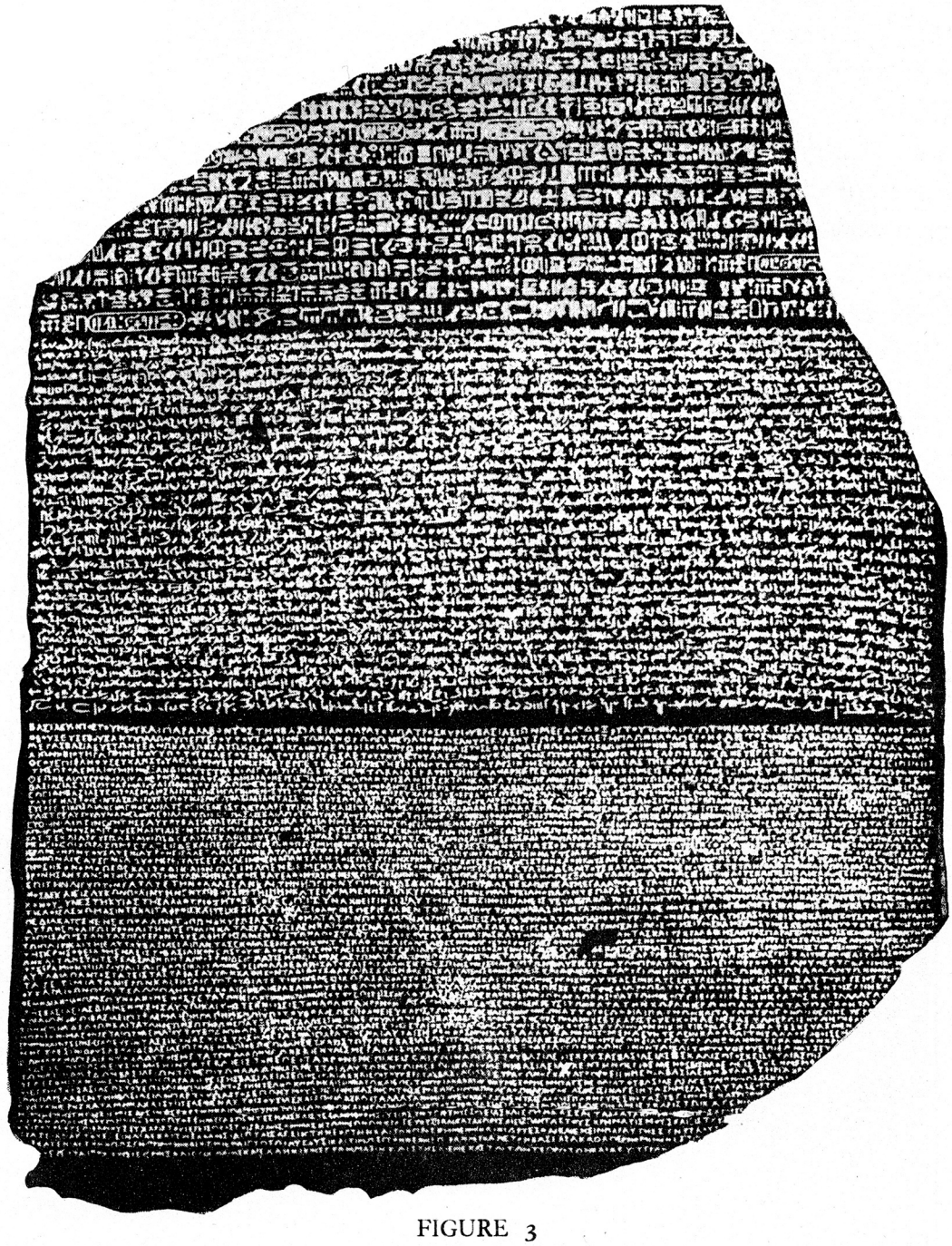


FIGURE 3
The Rosetta stone, found in Egypt in 1798.

thirty or forty in the section which is now England, but in that part of Europe which is now Germany some of the original twenty-four signs were dropped, so that only sixteen remained. The runic characters were

used by the ancient Norsemen, Scandinavians, Anglo-Saxons, and all the Teutonic races. Sometime during the third century the runes had spread from Denmark into Sweden, and in the fourth century there were numerous stone monuments with runic inscriptions in Sweden and elsewhere.

The Rök Stone

The so-called Rök stone, discovered at Rök, in eastern Götaland, Sweden, which probably dates from about 750-800 A.D., is the finest and largest specimen of Swedish-Norwegian runes so far found. The tops of the four sides are covered with runes. This stone was erected by a father in memory of his son, and the inscription appears to have the magical purpose of wreaking vengeance upon his son's slayers. In the *Encyclopedia Britannica* the beginning of the inscription is deciphered and translated as printed under Figure 4, which see.

Genealogy of Our Alphabet

We may now enter into a discussion of our own English alphabet. Tracing its development backward, we received the Latin or Roman alphabet from the Greeks, and the Greeks received theirs from the Phoenicians; but from whom the Phoenicians derived their alphabet we do not know. Mr. Otto F. Ege, in *Pre-Alphabet Days,* says that the Phoenicians, sometime after 1500 B.C., began to spread, in their trading voyages with other ancient races, representations of twenty-two common articles or objects. The initial sound of each object was used to express one of the elementary sounds in their language; as, for instance, *ah* from *alef* (cow, ox, or ox-head). It seems that the development of the first true alphabetic system resulted from the contact of those great traders—the Phoenicians—with the peoples of Egypt, Assyria, Crete, and other countries of the Mediterranean basin. This system or alphabet is said to be the parent of the Hebrew, Greek, Latin, Arabic, Russian, Cadmean, and Coptic characters. The Phoenician symbols were very crudely drawn; but the Greeks, after they adopted them, improved and refined them. The Romans, influenced by their architecture, introduced the curved forms into the symbols; the Middle Ages eliminated many of the strokes; the Gothic period (from the thirteenth to the sixteenth centuries), in order to economize in parchment or paper, made the letters angular; and the Renaissance, to facilitate the writing of the characters, tilted the letters. The development and changes in the architectural styles of the nations also influenced the shapes of the letters.

It may be stated, however, that the Phoenicians were not the only ancient race of people who had a system of writing. Other nations had numerous symbols and sound-expressing but non-alphabetic characters

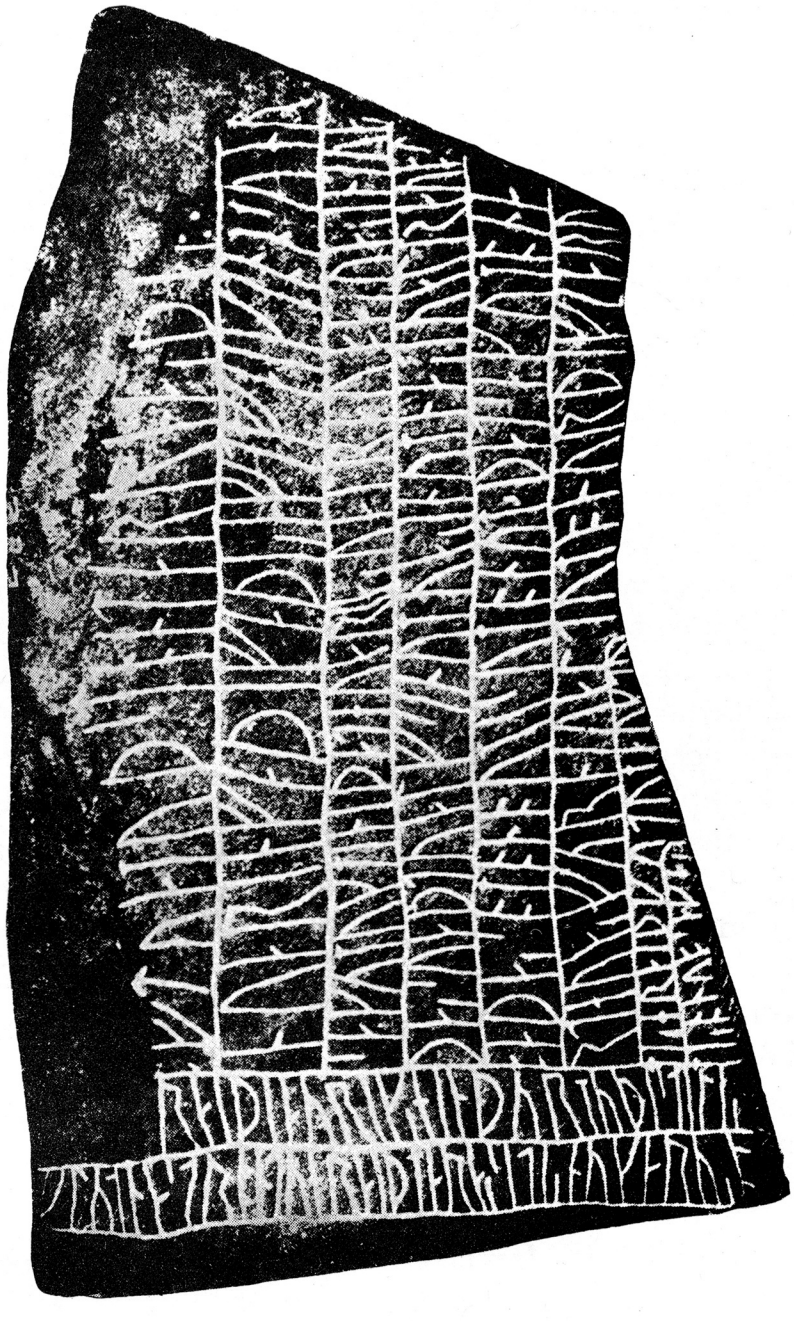


FIGURE 4

The Rök stone, found in Sweden. Inscription: aft uamuth stonta runaR thaR in uarin fathi fathiR aft faikion sunu; which means "In memory of Vämod stand these runes. And Varin, the father, made them in memory of his son, overtaken by death."

—so-called pictographs and phonograms or sound-pictures. The development of the Phoenician alphabet, during many hundred years, probably occurred along the following lines:

(1) *Picture Writing*—The pictures or symbols suggesting an object or an incident.
(2) *Ideographic* or *Symbolic Writing*—The pictures or characters symbolizing an object or an idea.
(3) *Phonographic Writing*—The pictures or characters representing the sound of an object or an idea.
(4) *Alphabetic System*—The symbols or characters suggesting the various sounds of a language.

In the development of our alphabet, the chief contribution of the Phoenicians was the segregation of the fourth stage from the other three stages.

The Greeks learned the art of writing about the ninth century B.C. They first used one of the varieties of the alphabet known as the Cadmean. The characters of the first alphabets were written from right to left; then the lines ran like the furrows of a plow in a field, alternately from right to left, and from left to right, which was called the *boustrophedon* method of writing; and finally the writing all ran from left to right as it does today.

The Latin alphabet contained twenty characters of the Greek western alphabet and three additional letters, G, Y, Z. Our English alphabet now has twenty-six letters, the additions to the Latin characters being J (an alternate form of I); U, which is another form of V; and W, which consists of two ligatured V's and is equivalent to a double U. The word alphabet comes from the first two symbols of the Greek alphabet—*alpha* and *beta.*

In the illustration on the next page, taken from Otto F. Ege's *Story of the Alphabet,* may be seen the development of our letters from the Phoenician alphabet down to the present time.

Ancient Writing Materials for Manuscripts and Books

The earliest books were written on rolls of *papyrus.* Papyrus was made from a reed which grew abundantly in the Nile Valley of Egypt. The inner bark of the papyrus plant was called by the Greeks βίβλος or *biblos,* from which the words bible, bibliography, and other similar words are derived.

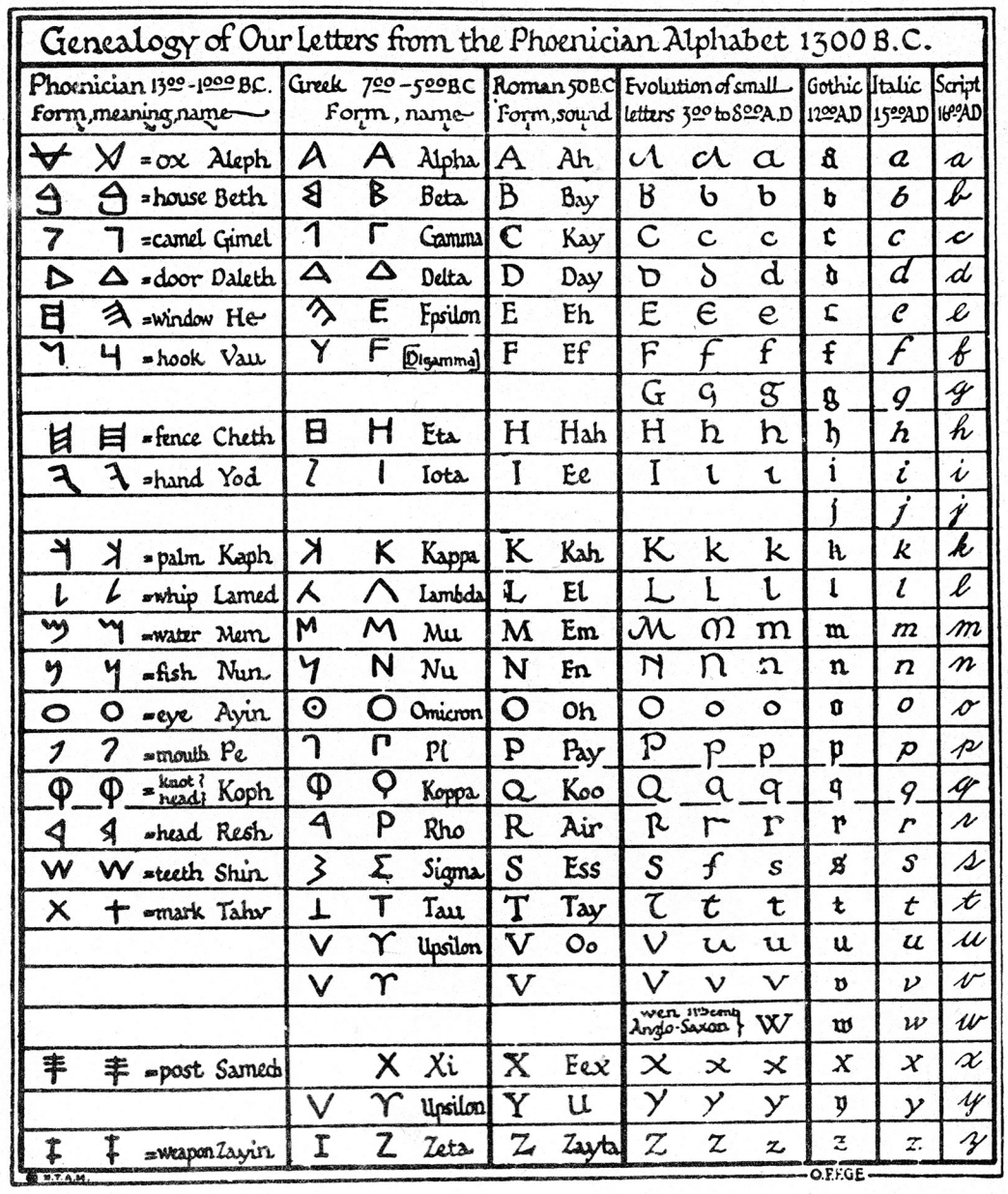


FIGURE 5

The development of the Roman alphabet.

Shown by permission
of the Norman T. A. Munder Company.

Papyrus rolls were made by cutting the stalks or inner bark of the plant in thin strips and laying these side by side on a board. Another layer was then laid crosswise in a similar manner and this mat or "net" of papyrus strips was placed in water (usually Nile water) and allowed to soak. The action of the water caused the strips to dissolve partially and combine, thereby forming a sheet, which, while

it was being dried in the sun, was scraped or hammered to level any uneven surface. The papyrus sheet was finally finished by rubbing it with a hard smooth substance, which gave it a certain polish. The sheets were evenly trimmed, and about sixteen to twenty of them joined, edge to edge, making a long strip. This was attached to a cylindrical stick or roll and was used as writing material.

Papyrus Rolls

Many of the early papyrus rolls may still be seen in museums and libraries. One of the earliest handwritings known is that of the "Papyrus Prisse," found in a tomb of one of the Antefs, within the Necropolis of Thebes, at Drah-about-Negga, which is now preserved in the Bibliothèque Nationale, at Paris. It is in Egyptian hieratic characters, and is supposed to date from the eleventh dynasty. This papyrus consists of twelve connected sections, which are of irregular size, but approximately in demi-folio.

Fragments of letters on papyrus, in hieratic characters, were found a few years ago by Dr. George A. Reisner during his excavations of the tombs and pyramids of the twelfth Egyptian dynasty (about 2300-1927 B.C.), in the Nile Valley. The hieratic symbols are the cursive or abbreviated form of the hieroglyphic picture-writing.

About 900 B.C. the Egyptians began using, in their commercial dealings, a simplified form of hieratic symbols, which are known as demotic characters.

The oldest Greek papyrus manuscript in existence is probably that of the *Persae* of Timotheus, which is preserved in the State Library at Berlin. It is believed to date from the latter part of the fourth century B.C.

Papyrus usually had the writing on only one side, and it was then wound around a short stick, or the stick was attached to one end. More frequently, however, there were two sticks, one at each end of the papyrus, somewhat after the manner of our wall-maps today. The writing in the most ancient scrolls ran across the narrow way, so that the sticks were at the top and bottom as the partly unrolled scroll was being read. In the later development of papyrus scrolls, the writing ran parallel to the length of the roll, and space was allowed between the different sections or columns. The short sticks became rolls or small cylinders with handles, to facilitate reading and rewinding. When the scroll was rolled up, and not in use, a band was tied around it.

The same method of writing in evidence on the papyrus roll was followed in the early vellum manuscripts. At first the vellum leaves had narrow columns of writing, but gradually the lines were lengthened until the pages had one, or at the most, two columns. For instance, the

FIGURE 6

The *Codex Alexandrinus.*

Sinaitic codex, of the Bible, which dates from the fourth century, and was written in Greek *uncial letters,* has four columns to the page. The *Vatican* codex, sometimes called *Codex B,* also from the fourth century, has three columns to the page, but in some sections either two or

four columns. The *Alexandrian* codex, dating from the fifth century, a page of which is shown in Figure 6, has two columns, while the codex of *Bezae,* of the sixth century A.D., has but one column to the page.

Parchment

Another early writing material was *parchment,* which was made of dressed skins. It is said that untanned leather became popular as a writing material in the second century B.C., through Eumenés II, king of Pergamos, a city in Asia Minor. Owing to the scarcity of papyrus, King Eumenés caused the skins of young animals, such as sheep, goats, calves, and the like, to be employed instead. The skins were carefully cleaned and the hair removed by soaking in a solution of lye. They were then scraped with a knife to remove any soft or fatty parts, after which they were rubbed down with pumice and finally polished with agate. This writing material was called, from the name of the city of its origin, *pergamena* (the German word is *Pergament*), from which we derive the word parchment. Parchment was long used for legal documents, and it is still occasionally used for college diplomas. Today the general term for leather writing material made of calfskin is *vellum,* and that made of sheepskin is *parchment.* These materials are prepared in sheet form, although in ancient days they were made in rolls.

The parchment sheets were carefully prepared by the scribes. Lines were pricked off by use of compasses, and ruled with a stylus, which made a crease on one side of the sheet and a raised line on the other. The ruled sheets were folded once and four of these folded sheets were fitted into one another, so that when pressed together they made a solid gathering, called a *quaternion,* from which we derive the word quire. Each quire had a mark on either the first or the last page. In the eleventh century *catch words* were used to show the connection of the text from one quire to the next.

There were other early writing materials besides those so far mentioned here. In China, during the Chou dynasty (255 B.C.), most of the writing was done with a bamboo pen, with ink of lacquer made from the sap of a tree, upon thin pieces of wood or slips of bamboo. The strips of bamboo were about nine inches long by one-half inch wide. The bamboo strips were frequently perforated at one end and tied together with leather thongs, and thus made into books. Somewhat later, after the invention of the hair writing-brush, by General Mêng T'ien, silk fabrics also were used as writing material. Paper came next.

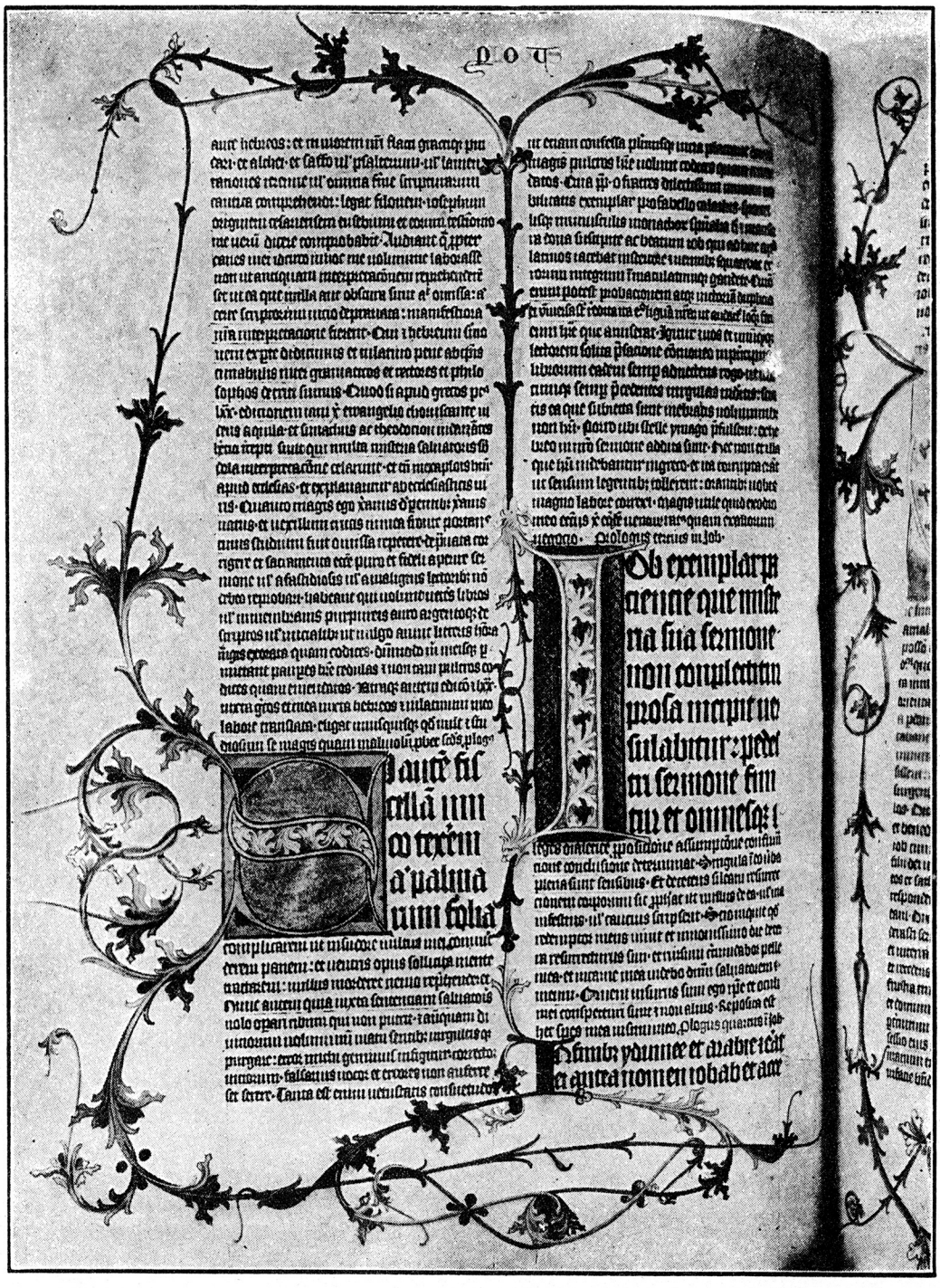


FIGURE 7

A page from a manuscript Bible; Salzburg, Austria, about 1428 A.D.

Making Books in Ancient Days

As already stated, ancient books were written on rolls of papyrus, and these were called *volumen,* from which we derive our word volume.

The book, as we know it, originally was called in Latin the codex, from *caudex,* which meant a pile of boards. The other Latin word for book is *liber,* from which we have the word library and other allied terms.

From the sixth to the sixteenth centuries the monasteries and abbeys of the Old World were inns as well as places of refuge. The monks were the instructors of youth, the teachers of religion, and the scholars of the Middle Ages. The monastic libraries contained, and preserved, the literary treasures of classic Greece and Rome. Writing and the making of books were occupations of the monks. The copying of religious manuscripts was a duty of every obedient and faithful "brother," and it was carried on with a zeal, persistence and enthusiasm unknown in our present-day materialistic life. The cloisters produced a class of writers and artists whose work in copying and illuminating manuscripts was unsurpassed in any age.

Thousands of these hand-made volumes, products of the monastic *scriptorium,* are still in existence, most of them in foreign libraries, but some of them may be seen here in America, in museums, libraries, and private collections.

Every abbey had its own forest, farm, meadow, and herd of cattle and sheep, so that material for vellum and parchment could easily be obtained. Black ink was made from lampblack or soot, mixed with gum. Cinnabar and cochineal were used for the red ink. Pens were made from reeds or the quills of fowls. Goatskins or cowhide, tanned with the bark of the oak tree, produced the leather for the covers of the books.

Vellum Manuscripts

Among the famous leather manuscripts may be mentioned the *Alexandrian* codex, dating from the fifth century, which is written on antelope skin, in uncial characters. It is preserved in the British Museum, London.

The *Codex Vaticanus,* in Rome, dates from the fourth century. The Vatican codex, which is written in Greek uncial letters, consists of 700 leaves of finest vellum, about twelve inches square, bound together in book form. It is neither perfect nor complete, so far as the writing is concerned. Most of the text has been inked over, so that very few of the original letters remain.

The *Codex Aureus* is among the most beautifully illustrated of the Carolingian period. It is an *evangelarium,* or abstract of the Gospels, written in uncial letters, at Corbie, France, for the Emperor Karl the

FIGURE 8

A page from the *Codex Latinus Aureus,* much reduced in size; of French origin, dated about 870 A.D. The original pages are folio format and measure about 12 by 20 inches. The cover of the book is solid gold, ornamented with precious stones.

Bald of Bavaria, about 870 A.D. The book is entirely in gold letters, and the illustrations, many of them full pages, are in several colors, with ornamental initials and borders. The original is preserved in the Bavarian State Library at Munich.

The *codices* are ancient manuscripts of the Scriptures or the classics. There are about 115 of the Bible on parchment in uncial characters, dating from the fourth to the tenth century. There are some 1200 manuscripts written in cursive characters (the earlier ones on parchment, the later ones on paper), which date from the ninth to the sixteenth century. These contain the Gospels and parts of the New Testament.

One of the earliest illuminated manuscripts still extant is the *Book of Kells,* also called *Colum Cille,* which was found in the ruins of the Monastery of Kells, in the town of Kells, Ireland, after the monastery had been pillaged and sacked by the Danes in the tenth century. It consists of 339 leaves of finely glazed vellum, about 9½ by 13 inches in size. The penmanship, in half-uncial letters, is considered the finest in existence. There are from seventeen to nineteen lines on each text-page, which cover a surface of 7 by 10 inches. The book contains a copy of the Gospels, and was probably written by St. Columba, the apostle to Ireland, who lived from the year 521 to 597 A.D. Dr. Mundae Thompson, an English authority, assigns the writing of the book to a later period, about the end of the seventh century. The many decorated pages are beautifully colored, but without the use of gold, so commonly found in later manuscript books. It was produced during the period when Celtic illuminative art was at its height, and is unequaled as a specimen of early calligraphy. This manuscript was the basis for the Carolingian script. The *Book of Kells* is preserved in the library of Trinity College, at Dublin, Ireland.

The *Book of Hours,* or *Horae,* was a popular illuminated manuscript volume of later years. There were different copies of it in the different monasteries, and after the invention of printing many copies were produced during the latter part of the fifteenth and the first half of the sixteenth century.

The *diptychs* of ancient Rome are said to be the direct prototypes of our modern books. The diptychs were small wooden boards, slightly hollowed and covered with wax on one side. These wax-covered tablets (the word *tablet* comes from the Latin *tabella*) were hinged together by means of metal rings or leather thongs, and this gave them their first name. Later, three or more of the tablets were joined together like a

FIGURE 9

A page from the *Book of Kells,* reduced in size. The original measures about 9½ by 13 inches, and is embellished with many colors. The letters are half-uncials, ornaments being used freely within the lines.

chain. Writing on them was incised with a metal stylus, which had one end pointed and the other flat. The flat end was used for erasing. The earliest diptych in existence bears a date of 55 A.D., and was excavated at Pompeii, in 1875. The writing on it is in Latin.

Peculiar Features of Early Manuscripts

In early Latin manuscripts there were no sentences, and no space or separation between words. Word separation probably began during the sixth century, when this language was used by the Germans, to facilitate reading, because Latin was foreign to them. Specimens of half-uncial characters show word separations clearly as early as 500 A.D.

During the fourth century A.D. the paragraph was indicated by a horizontal mark rather than by spacing. Paragraph indention came later, and it was followed by the use of the larger letter, which was first employed to indicate the beginning of sentences. The development of the sentence dates from about the eighth century A.D.

Beginning of Punctuation

Some very early manuscripts show the rudiments of punctuation, but it is difficult to tell just where punctuation of manuscripts began. The first punctuation mark was the stop at the end of a sentence. This was originally two dots, or like the present-day colon. Later the period became one dot by omitting the lower point of the colon, so that the second form of the period is a dot on alignment with the waist-line or top of the round lower-case letters. The period, colon, and comma were each represented by a single dot, the value depending upon whether it was on a level with the top, the middle, or the bottom of the letter. Later the comma became a diagonal stroke, and from that it changed into its present form.

The apostrophe made its appearance during the sixteenth century. At first it consisted of a single dot (period), and was placed before or after the remaining consonant of a word, either on line with or above the other letters of the contracted word. Sometimes it appears as a double dot (like our colon).

During the nineteenth century a system of punctuation was developed which was approximately as we have it today.

The division of words caused the scribe less trouble than it does the modern compositor. The scribe was not limited to the resources of a type

FIGURE 10

A page from an eleventh-century English manuscript, showing Carolingian majuscule and minuscule letters.

font. He did not hesitate to crowd his letters and resort to irregular and uneven spacing between words; he also reduced the letters in size in order to get a word into a line, and made use of various devices of abbreviating words and combining letters to accomplish the same result. The division of words in manuscript books was, however, always more or less in evidence. The Greeks usually divided after a vowel, with little regard to syllables. They even divided monosyllables in this way. Syllabic division was practiced by the Roman writers very much as it is used by us today.

A form of division of the text practiced by the early scribes was called *calometry,* which is much used in modern display composition. It consisted of breaking up the text into short clauses or sense-lines to facilitate easy reading. This was done particularly in manuscripts which were intended for oral reading, as in cases of orations, the Bible, and similar compositions.

The title of a work was usually inserted at the end and was accompanied by a brief account of the book, place of copying, name of scribe, date, or other information. This kind of appendix was called a *colophon.* The practice of writing colophons was taken over by the early printers and their colophons have become the source of much valuable information relating to the first printed books and pamphlets. Manuscript pages were not numbered until after the middle of the fifteenth century.

Quotation marks were indicated by ticks in the margin of the pages or by indented paragraphs.

Corrections in manuscript books were made by drawing a line through the word or words, writing over them, or, if the material permitted it, by washing the ink off with a sponge or erasing with a sharp tool. Omitted words or passages were inserted in the margins.

Abbreviations and contractions were extensively employed, for the sake of economy in writing and use of materials. Letters which commonly occurred together were elided and abbreviated. This was done as late as the eighteenth century, in England and America, at which period we find such abbreviations as *yt*=that. The *y* in this combination, as also in "ye," used as an article, is not the semi-vowel *y,* but is the survival of an Anglo-Saxon letter of similar form called "thorn" and equivalent in value to *th.* In the "yt," then, the *y* or *thorn* is substituted for the *th* and the vowel is elided, but the sign should be pronounced "that." The sign "ye" as in "ye olde mill," or similar phrases, should always be pronounced "the" and never like the pronoun *ye.*

FIGURE 11

A writers' room or *scriptorium* of 1470, showing the monkish scribes at work. The chief scribe, who also acted as adviser to the other copyists, is seated on the large bench at the left. Taken from a wood-cut illustration by Colard Mansion, a writer and illuminator of Bruges, Belgium.

FIGURE 12

A page from a manuscript book of 1567, showing beautiful Roman letters. The book belonged to a court-writer of Augsburg, Germany.

The Palimpsest

Because ancient writing materials were very expensive, the practice of erasing whole works was resorted to, in order that the vellum might be used over again. This erasing was sometimes done with a knife or

pumice-stone; at other times by washing the surface, and then rubbing the vellum to make it smooth. A manuscript thus treated is called a *palimpsest.* Frequently the original writing was more valuable than the work on the erased surface. In modern days it is possible to restore the original writing at least sufficiently to make it possible to decipher it. In this manner a number of rare texts which would have been entirely lost have been recovered from palimpsests.

Modern Examination of Ancient Manuscripts

Ancient manuscripts or palimpsests are now examined with ultra-violet rays, under which the partially erased original becomes visible again and can be photographed, thus furnishing a permanent record of ancient literature which had hitherto been thought lost. When examined beneath ultra-violet rays, various substances, including the tints and dyes left in the parchment from the earlier writings, fluoresce distinctly from those of the visible text, and from the parchment itself. The palimpsest can therefore easily be distinguished.

Guarding Manuscript Books

Before the invention of printing, during the Middle Ages, the most common method of preserving knowledge was through the handwritten or manuscript book. These books were therefore rare and costly, because of the time required to produce them. Many of them had no duplicates.

In the abbeys, cloisters, and libraries, during the twelfth to sixteenth centuries, valuable manuscript books were guarded against theft by iron chains. In the Bodleian Library, at Oxford, England, this practice continued until about 1760, more than 300 years after the invention of printing. In this library the early printed books were guarded in the same manner.

CHAPTER II

BLOCK-PRINTS AND BLOCK-BOOKS

Block-printing began in China and then spread to Japan soon afterward. In 1907, in Eastern Turkestan, near the city of Tun-huang, in one of the Caves of the Thousand Buddhas, there was found, by Sir Aurel Stein, a member of the British Academy and a notable explorer of innermost Asia, the oldest block-printing.

In a sealed chamber, which had been closed and forgotten for nearly 900 years, among an ancient library of 15,000 or more Buddhist texts and manuscript rolls, written on paper, in Chinese, Tibetan, Sanskrit, Sogdian, Turkish, and Hebraic, there were four books, one of them with folded leaves, all printed from wood-blocks. The earliest of these books is dated 868 A.D. Mr. Thomas F. Carter, late professor of Chinese in Columbia University, in his book, *The Invention of Printing in China and Its Spread Westward,* has this to say of Dr. Stein's discovery: "This book, which is almost perfectly preserved, shows already an advanced technique, behind which there must have been a long evolution. It is less crude than any of the European block-printing of pre-Gutenberg days. The book consists of six sheets of text and one shorter sheet with a wood-cut, all neatly pasted together so as to form one continuous roll sixteen feet long. Each sheet is two and a half feet long by nearly a foot wide, indicating the large size of the blocks used. At the end, printed into the text, is the statement that the book was 'printed on May 11, 868 A.D., by Wang Chieh, for free general distribution, in order in deep reverence to perpetuate the memory of his parents.' " The *Diamond Sutra,* a section of the Buddhist scriptures, appears in this roll. The *Sutra* was a favorite book among the early printers in Central Asia, China, and Japan.

The earliest extant block-printing, however, comes from Japan. This consists of the Buddhist charms, printed by the Empress Shotoku about the year 770 A.D., in the Sanskrit language and in Chinese characters, and deposited by her in various temples. The size of these small charms is about 6 by 46 centimeters.

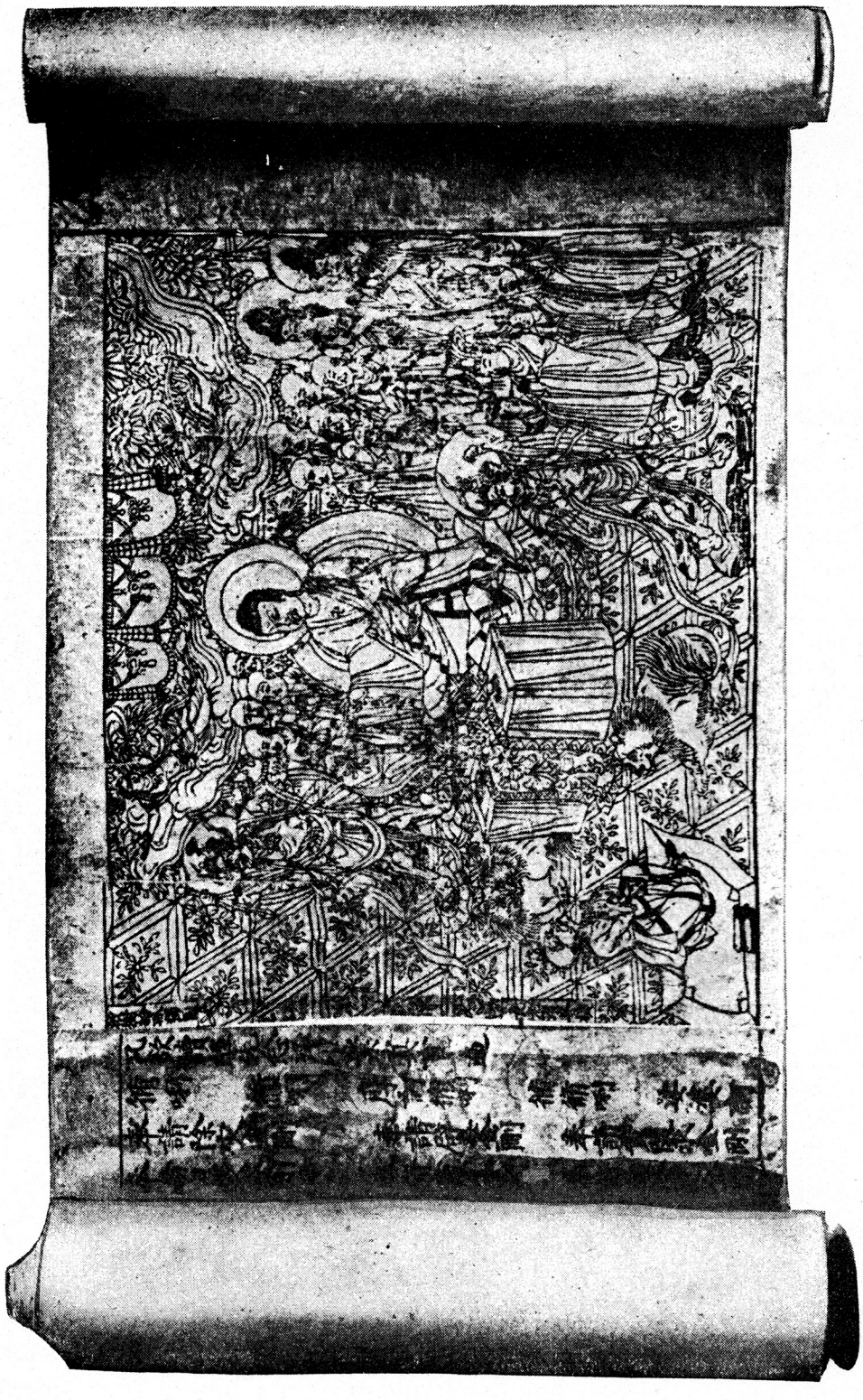


FIGURE 1

The oldest block-printing in the world—the *Diamond Sutra*.
The original is preserved in the British Museum.

From China and Japan the art of block-printing spread to Europe. In Southern Germany and the Netherlands, a great deal of the early block-printing was that for making the outlines of religious pictures and for playing-cards, which were afterward filled in with color, either by hand or through the medium of stencils. This was a well-established industry as early as 1400.

In the Low Countries, the evidence in the record of a lawsuit at Bruges shows that wood-block cutters were at work in 1400. At Liége there were similar activities in block-cutting about 1420.

In Munich, Germany, there are preserved several twelfth-century manuscripts in which the initials were stamped in with wood or metal relief plates.

Early Block-Prints

One of the earliest of the single block-prints or *Einblattdrucke,* as they are called in Germany, that bear a date is the *St. Christopher* of 1423, one copy of which is now preserved in the John Rylands Library at Manchester, England, and another one in the State Library at Vienna, Austria. The latter was found pasted inside the cover of a manuscript book in the library of a convent at Buxheim, near Memmingen, in Swabia, Germany. This print is sometimes referred to as the Buxheim *St. Christopher.* This print, in black lines, is colored by hand, in gray, green, brown, and yellow. It has a Latin legend, which may be translated: "One cannot be overtaken by evil or die, on the day that one looks upon the figure of this saint." The English copy, also found pasted inside the cover of an old manuscript, is 8½ by 11½ inches in dimension.

There are, however, other single wood-block prints which are supposed to antedate the *St. Christopher.* Among them is a picture of *The Annunciation,* which was found pasted on the end or back cover of the book, *Laus Virginis,* in which the English copy of the *St. Christopher* was found, and is of similar size. There are two different copies of the *St. Dorothea,* one dated by Dr. W. L. Schreiber as of 1400-1420, and the other, somewhat larger in size, 1410-1420. In the Bibliothèque Royale de Belgique, at Brussels, there is a colored print, in poor state of preservation, of *The Virgin with Four Saints*—St. Catherine, St. Dorothea, St. Barbara, and St. Margaret. This print measures about 9 by 14½ inches, and was found, in 1844, pasted at the bottom of an old coffer, in possession of an innkeeper at Malines. It is sometimes called the *Brussels*

Madonna, and some authorities attach a date of 1418 to it. These Roman numerals appear below the picture, but there is a dispute on their authenticity because the style of composition and the arrangement of the folds in the garments belong to a later period. It is assumed that it is

FIGURE 2

The *St. Christopher* of 1423, showing the saint carrying the infant Jesus across a stream.

a copy of an earlier print, but without change of Roman numerals. A second copy, in good condition, found later, is in the Memorial Library at St. Gallen.

Monsieur André Blum, librarian of the Baron Edmund de Rothschild Collection in Paris, claims that several of the early French woodblocks and prints were made before the year 1400.

Most of the single wood-block prints were found pasted inside of manuscript books, and only one or two copies of each picture is in existence. There were probably 200 different wood-block prints.

The purpose of the early single block-prints was to aid in teaching the Scriptures and religion. Sometimes they were used as substitutes for the paintings and the sculpture in the churches. The possession of a relatively small block-print made it possible for the pious and faithful to gaze upon the image of the Virgin or a saint at any time in their own home.

All the one-sheet block-prints were produced by applying ink to the block, placing the paper upon it, and then exerting pressure on the back by rubbing with a burnisher, scraper or other device. Some authorities claim it was done by means of a small cloth- or leather-covered rocker. In isolated instances it was done in a press.

The making of wood-block prints continued long after the invention of printing from metal types, most of the blocks having the illustration and text-matter or legends in one piece. In some instances, however, metal types were used for the text-matter after the year 1475. There are some fine specimens of single block-prints, beautifully colored by hand, in the museums, libraries, and private collections. A notable one among these is *The Annunciation,* possibly from one of the French cantons of Switzerland. This print (Figure 3) is in six colors: red, purple, gray, green, yellow, and pink. Some of these appear to have been applied through stencils. A date of 1480 has been assigned to it by Schreiber. The text-matter below the picture is printed from metal type. It is in the collection of Mr. James C. McGuire, of New York City.

Classification of Block-Books

Block-books may be placed in two classes. The earliest ones were printed with a thin pale-brownish ink, on one side of the leaf only. They were produced by placing a sheet of soft paper upon the inked block and transferring the image and text to the paper by rubbing or scraping on the back of the sheet, with a slight mechanical pressure. All the Oriental block-books and prints before the year 1500 were produced by this rubbing method. The second, and later, class was usually printed in a press of some kind with a thick ink, and on both sides of the sheet.

The art of making and the method of printing wood-blocks was developed to great perfection in Austria, Germany, Holland, France,

FIGURE 3

The Annunciation, of 1480, a single block-print. The Latin legend below the picture is printed from metal type.

and Switzerland. Many of the early block-books closely resemble the early printed works. The printing of monograms and seals was also done from wood-blocks.

In making the plates for the xylographic books, the contents of each individual page had to be cut upon a block of wood, and this was a laborious process. The text for the page was not always cut by the same person who cut the picture, nor was the block-cutter and the printer always the same person. Sometimes the text-matter and the illustration were on separate blocks of wood. Some of the block-cutters produced blocks for several printers, which explains the similarity of letter styles in different localities. Wood-blocks were not convertible; that is, they could not be used for any other purpose except that for which they were originally cut. The block-books were therefore of a popular nature, mainly concerned with religious instruction or pious edification, and lending themselves readily to pictorial or allegorical illustrations. The best-known of these books were the grammar of Ælius Donatus, who was a Latin grammarian and commentator on the works of Terence, and lived during the fourth century (his school books were commonly called *donate*); the *Biblia Pauperum,* or Poor Man's Bible (poor in mental development); the *Speculum Humani Salvationis,* or Mirror of Salvation; the *Ars Moriendi,* or the Art of Dying; and the so-called *Doctrinale,* a Latin grammar in rhyme, by Alexander Gallus.

The Xylographic Donatuses

The donatuses were the largest in number, because they were Latin instruction books. Usually they consisted of about 16 to 32 pages, ranging in size from 4½ by 6¾ inches to 6 by 8¼ inches. It appears that these books were also issued in sections, and were sold unbound, in pamphlet or folder form. About twenty-five of them, partly fragmentary, printed on parchment or paper, are still extant. The donatuses have been divided into three groups:

1. Dutch origin; easily recognized by their letter-style;
2. German origin; letter-styles like those in the early printed books;
3. The earliest ones, having letter-styles in imitation of various manuscript hands.

It may give a clearer understanding if one of these early block-books is described in detail.

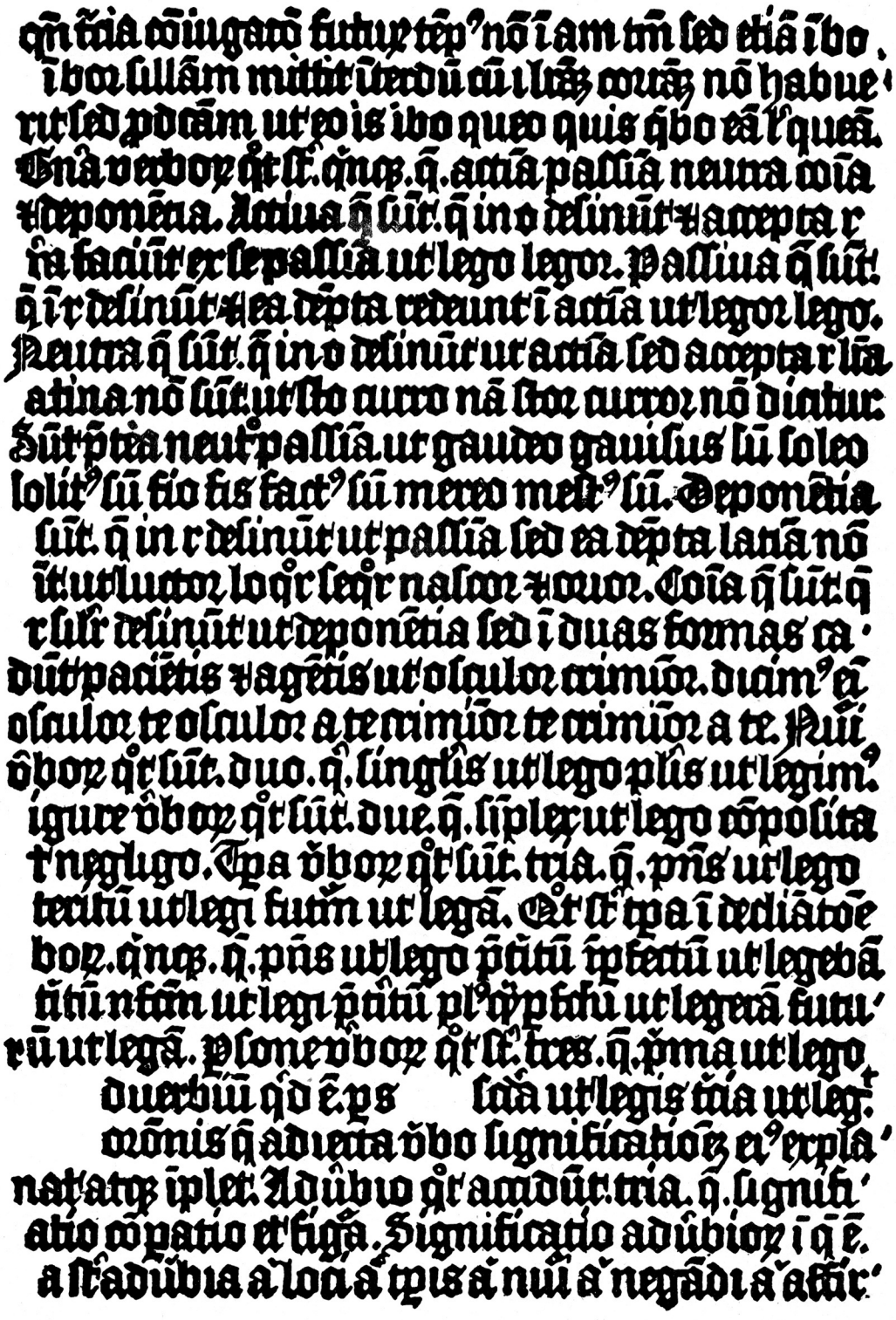


FIGURE 4

A page from one of the earliest Dutch donatuses, slightly reduced. The original is 4⅝ by 6¾ inches in size. The blank spaces, four and five lines from the bottom, are intended for the hand-drawn initials, which were put in after the printing.

Of the Dutch donatuses, the only perfect and complete one is in the Athenäums-Bibliothek at Deventer. It consists of fourteen leaves, in two signatures of eight and six leaves, printed on parchment. The margins are scanty, the pages being well filled, twenty-eight lines on each, having a type-surface of 115 by 166 millimeters. This donatus is undated, but it may have been printed about 1470–1490. (Its letter-forms are like certain manuscript hands of that period.) Since the style of letters is unlike any of the then existing printing types, and further shows considerable variation in the forms of corresponding letters, it is assumed that it was copied from a manuscript donatus. The five-line and two-line initials were painted in red, by hand. On some of the pages space was left at the beginning of sentences within paragraphs for a hand-drawn or illuminated letter.

Figure 4 shows leaf 5a of a donatus which is in the British Museum. Although it agrees line for line and word for word with the Deventer donatus, it was not printed from the same blocks, certain letter-characteristics establishing this clearly. The London specimen is probably a recutting of the Deventer copy.

Although wood-block books, in point of development, may be regarded as standing between the single wood-cut pictures or prints and the earliest books printed from movable metal types in Europe, they should not be regarded as their prototypes. Some authorities have claimed that the donatuses were the forerunners of books printed from metal types, but the latest research work of the most eminent scholars has disproved this claim. Dr. Konrad Haebler says it is uncertain whether or not any of the donate were printed before the invention of typography. Perhaps the early wood-cuts suggested to Gutenberg the desirability of an improved method of producing relief letters for the printing of books or the duplication of manuscripts.

Block-Cutting After Typography

After the inauguration of printing from metal types, the xylographic method of printing continued, many donatuses being produced in Europe, their letter-designs imitating different type-faces in use for printing books. As notable examples may be mentioned the *Donatus* by Konrad Dinckmut, and the *Ars Moriendi* of Ludwig, of Ulm, both of which appeared in 1470. (Konrad Dinckmut, before he acquired his own printery, was the wood-cutter for Günther Zainer, the Augsburg printer.) The printing of block-books continued until about 1525.

The early wood-block, cut from beech, elm, or pear-tree wood, was rather soft. When the prepared block was moistened with ink and sub-

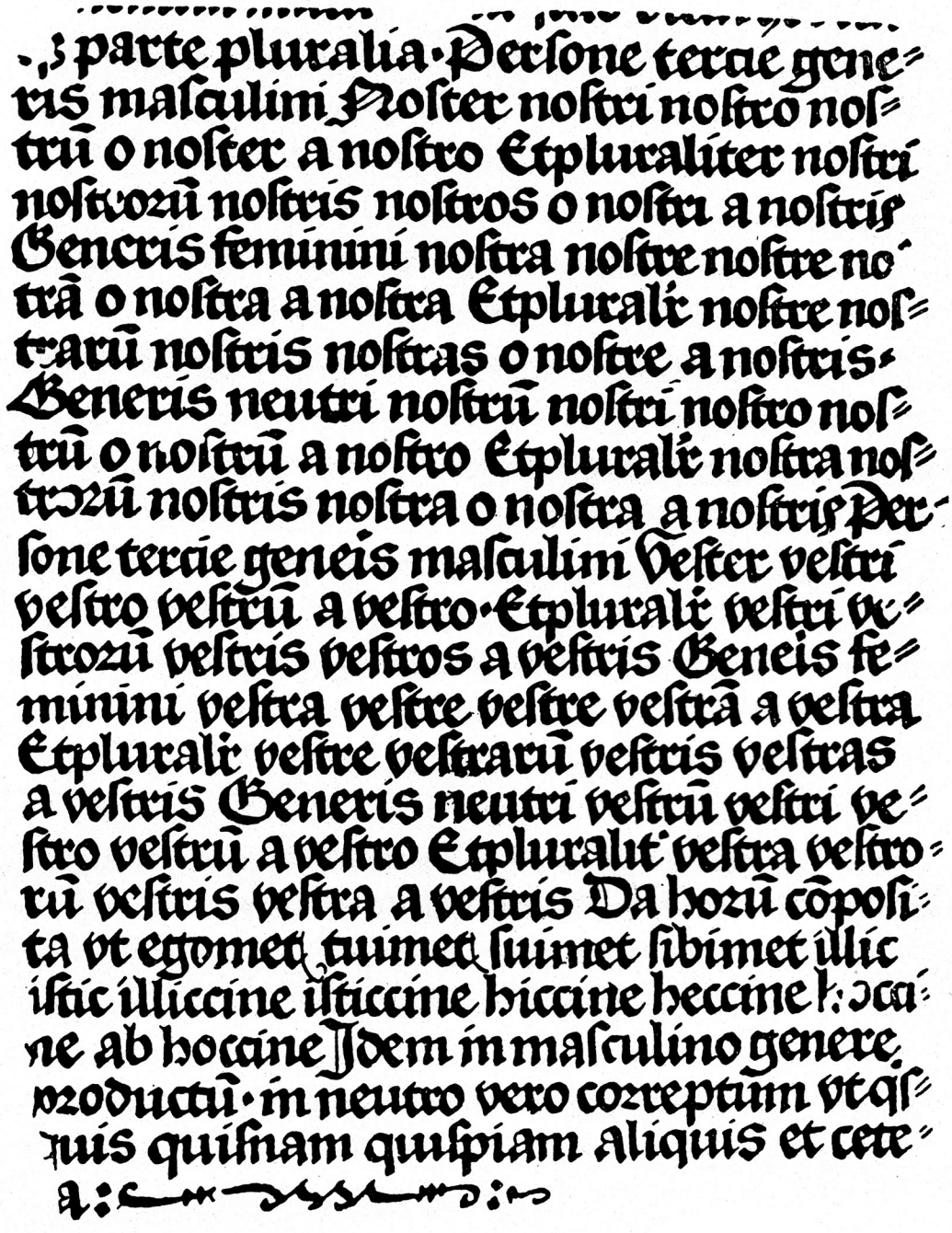


FIGURE 5

A page of a block-book donatus, of unknown origin, in the type style of Konrad Dinckmut; slightly reduced. The original measures 6 by 8 inches.

jected to pressure, its surface soon flattened and wore off, necessitating the cutting of a new block. Gutenberg knew this, and he also knew that

for continuous clear, sharp, and rapid reproduction of drawings (pictures) and text-matter, wood was an unsatisfactory material, and that it was quite inadequate for the speedy multiplication of the large volumes which he intended to produce. Hence, he had to discover a new method which did not depend upon wood as a printing surface.

Wood-Engraving

From engraving on metal (perhaps the goldsmiths were the earliest engravers), which preceded xylography, to the early practice of wood-block cutting, and the later process of wood-engraving, is, theoretically, but a step.

The early wood-blocks, which originated in Germany, were cut on the "plank side" of the wood, or across the length of the grain, with a knife; this tool was pulled toward the cutter. The design was first drawn on the smooth piece of wood and then all parts of the surface except the lines of the drawing were cut away, producing the effect of a heavy modern zinc line-etching. We now call this style of wood-cutting *black-line*, because the image is made up of black lines.

This method of cutting was used for several hundred years, or until about the time of Thomas Bewick (England 1753-1828). Specimens of black-line illustrations are shown in Figures 2 and 6. There was, of course, constant improvement in the work and technique of the wood-cutters of the fifteenth, sixteenth, and seventeenth centuries.

Among the many notable examples of black-line wood-cuts may be mentioned *The Apocalypse of St. John,* one of the earliest illustrated block-books (about 1465), in which both the pictures and lettering are cut on the wood. In later years, Albrecht Dürer, in Germany (1471-1528), used the black-line style in illustrating many of the chapters of the Bible, as well as for other pictures. Lucas van Leyden (Netherlands, 1496-1533); Lucas Cranach (Germany, 1470-1552); Hans Holbein (Germany, 1495-1543); and the Italian and French wood-cutters also employed black-line.

One of the best-known and finely executed books, other than the Bible, issued in Germany, with wood-blocks that purport actually to illustrate the text, is Breydenbach's *Perigrinationes* (Pilgrimages). The pen-drawings were made on the pilgrimage, by Erhard Reuwich, and the book was published at Mainz in 1486. It was probably printed in Peter Schoeffer's shop. This book is also notable because its illustrations are among the earliest examples which show a delicate wood block

technique similar in manner to that used by Dürer. The best copy of this book is preserved in the Landesbibliothek at Gotha; another copy is at Karlsruhe, Germany.

Albrecht Pfister of Bamberg, Germany, is accredited with being the earliest printer who introduced wood-cuts into his books. He produced

FIGURE 6

A wood-block cutter at work. Reproduced from a wood-cut in a book by Jost Ammann, printed in 1564.

four volumes, containing crude black-line wood-cuts, between the years 1460 and 1462. One of these was the first typographic edition of the *Biblia Pauperum*. This volume is, of course, not to be confused with the block-book of the same title, which probably was produced earlier than 1460.

In the *white-line* method, which was developed and popularized by Bewick, xylography became an art of *engraving,* and it may thus be distinguished from the more or less mechanical trade of wood-block cutting. This method also employs tiny dots and flicks, which add flexibility and variety to the appearance of the engraving.

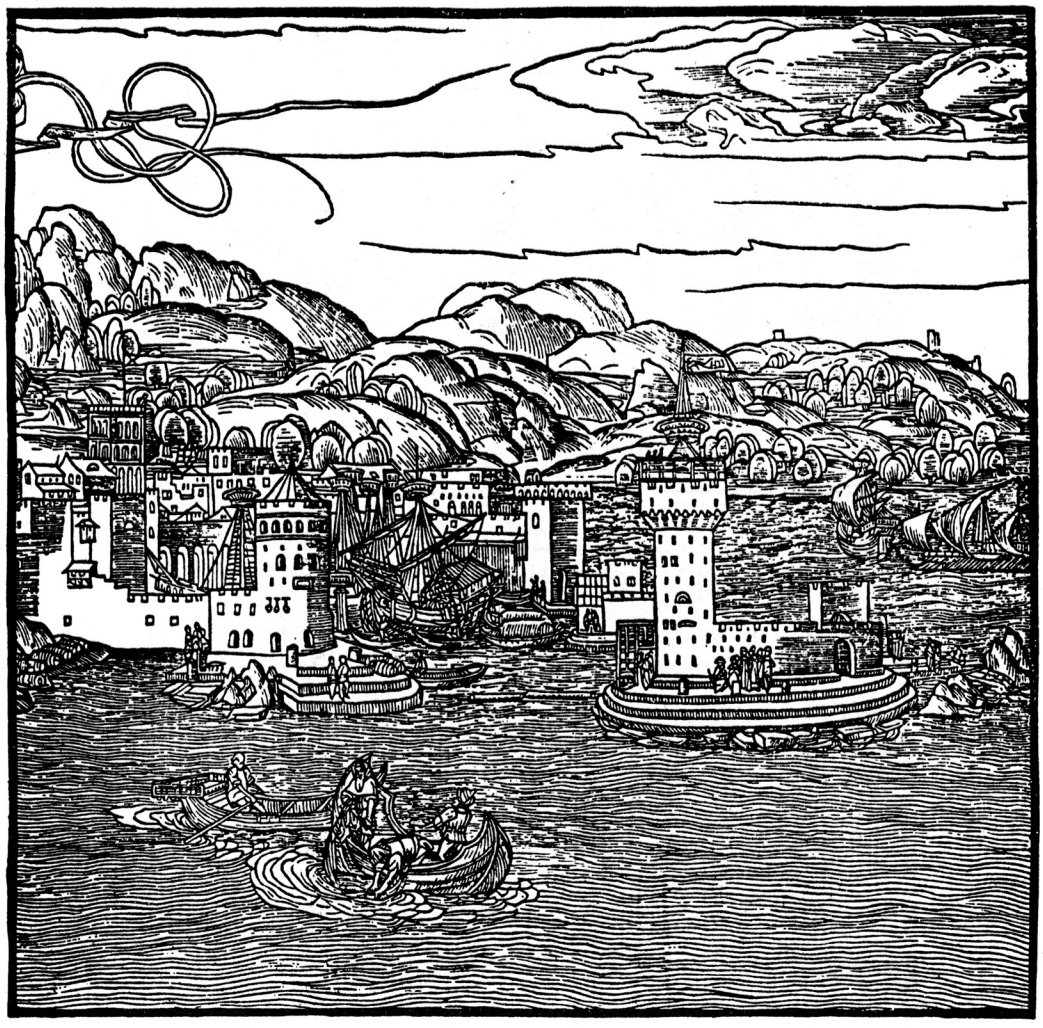


FIGURE 7

A reproduction of a wood-cut by Erhard Reuwich, from Breydenbach's *Perigrinationes,* published at Mainz in 1486.

By employing hard wood, instead of soft, wood-engravers were enabled to engrave upon the *end,* instead of *across* the grain. This made possible the use of the burin or the graver (both copper engravers' tools) in place of the knife as formerly. With the burin the incisions are made away from the engraver, or *plowed* into the surface of the wood, thus producing grooves which receive no ink, and in printing show as white

lines; hence the name. The burin, or the graver, surpasses the knife in that it permits free, easy strokes or cuts of any width and in any direction. While Thomas Bewick (1753-1828) was the first wood-engraver to use the white-line method extensively, he was not the first person to discover it. White lines, to indicate tone and color, on a black back-

FIGURE 8

A white-line wood-engraving, reproduced from Thomas Bewick's *History of British Birds,* published in 1786.

ground, first appear on fifteenth-century German metal engravings. Figure 8, by Bewick, from *The History of British Birds,* shows a good example of white-line wood-engraving. Other notable specimens are *The History of British Quadrupeds,* 1790, by Bewick; *Northcote's Fables,* 1828, embellished with 180 wood-engravings by such men as Nesbit, Branston, Jackson, Orrin Smith, John Thompson, and others. Many other books, equally interesting, could be mentioned.

A method of engraving known as *manière criblée* (sometimes called cribble), that is, the dotted style, was introduced about 1495. In this method the plate was engraved by a mixed process, partly in relief, partly in intaglio; but always upon wood. Manière criblée produces the effect of a series of dots and lines in white upon a black ground, assisted by dots and lines relieved in black upon a white ground. These single wood-block engravings were afterward reproduced on brass or copper in a sand-mold. In Germany the prints from such plates were called *Schrotdrucke*.

About 1507, in Germany, a process was originated to which the name *chiaroscuro* has been given. Fundamentally it is not unlike our modern color-printing. The process employed a key-engraving and one or more additional plates to produce the different shades, tints, or colors of a drawing. The several blocks were then printed in sequence. The high-lights were secured by cutting out the whites in the tint blocks so that the white paper would serve the purpose of highlights.

Present-day wood-cutters and wood-engravers use all the known methods and techniques; sometimes combinations of two styles are used. Today the artist usually cuts or engraves his own blocks. Wood-engraving is, however, not limited to the reproductive processes. It is used quite frequently as a means of original illustration. The design may be drawn or photographed onto the block. In case of a reproduction, with the employment of the camera, the engraver is left free to use his own lines, method, and feeling, in transforming the original design or picture into a printing plate.

CHAPTER III

THE INVENTION OF TYPOGRAPHY

Fifty years ago, no conscientious writer could have said, with any degree of certainty, where and by whom the art of printing from movable metal types was first practiced in Europe. Since then, such notable scholars and historians as Dr. Georg Leidinger, Dr. Konrad Haebler, Herr Gustav Mori, Dr. Gottfried Zedler, Dr. Albert Kolb, Dr. Paul Schwenke, Dr. Isak Collijn, Dr. Aloys Ruppel, Dr. Ernst Voullième, Seymour de Ricci, Dr. Adolph Schmidt, Sir Aurel Stein, Thomas F. Carter, and others have conducted far-reaching investigations and research work. The evidence which has been obtained establishes beyond a reasonable doubt that a person named Gutenberg, of Mainz and Strassburg, Germany, was the first to print from movable metal types in Europe.

There does, however, exist a difference of opinion as to the exact number of pieces which Gutenberg produced, their date, the manner of production, and other details. The author's own opinion agrees quite generally with that of Herr Mori, but he gives all the other men due credit for what they have done in their research work, and for the information which they have published in books and pamphlets dealing with the invention of typography.

Events Which Preceded Typography

At the beginning of the fifteenth century, the so-called revival of learning and intellectual thinking, known as the Renaissance, had just begun. New universities had sprung up in Erfurt and Leipzig, Germany; in Edinburgh, Scotland; and in Louvain, Belgium. There was a general revival in the study of the then existing arts and sciences, which meant the creation of many new books through the scribes, by the slow, inaccurate methods of the ancients. The greatest shortcoming of these manuscript books was the impossibility of writing out by hand anything like the number of books required to meet the demand; nor was the so-called *block-book*, printed from wooden relief plates, a commercially

successful substitute for the written book. This undoubtedly caused men to think of devising a method of rapid and inexpensive duplication of manuscripts—or a labor-saving method of writing; and this, in a broad sense, is exactly what printing is.

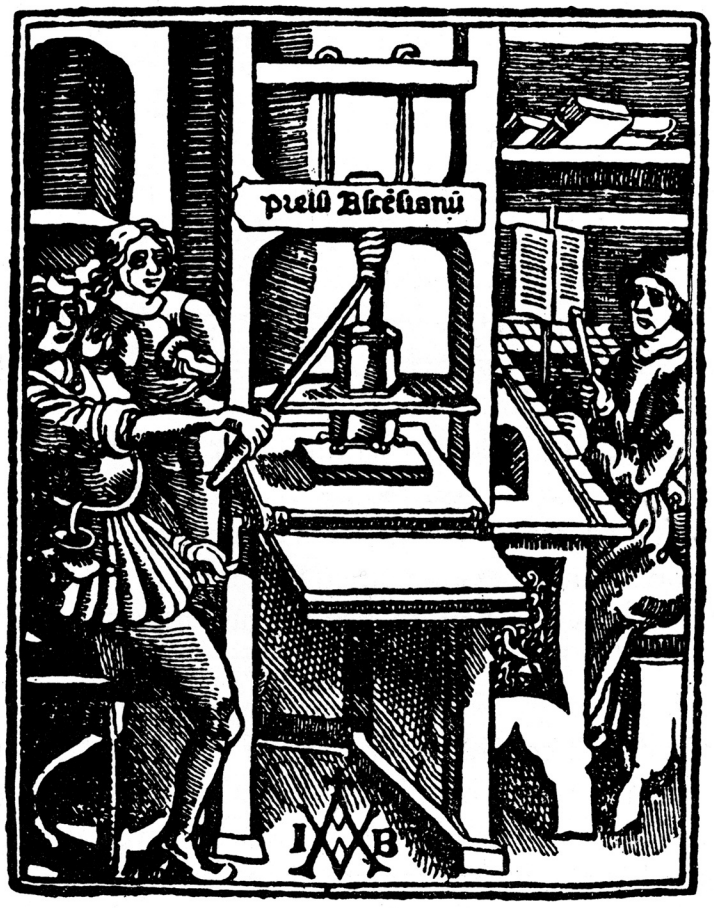


FIGURE 1

An illustration of a press used by José Badius Ascensius, in 1509. Badius was a notable Parisian printer, and used two different drawings of hand-presses among his printer's marks. This one is said to have been drawn by Albrecht Dürer.

In Europe, practically all the materials of which books are made were available. The Chinese had invented paper in 105 A.D., and the knowledge of paper-making had spread to the Continent through Samarkand. There were several paper-mills in Spain about the middle of the twelfth century; one in Hérault, France, in 1190, one in Montefano in 1276, and another in Fabriano, Italy, about 1315; one in Nürnberg in 1390. The Chinese are also credited with being the first to manufacture a kind of ink, about 220 A.D., from the sap of a tree or from the cochineal insect.

The invention of true ink, made from lamp-black, and used in China for both writing and for printing from wood-blocks, is ascribed to Wei Tang, who lived during the fourth to fifth century. The substance is now known as "India ink," because it came to Europe by way of India. It is, however, more fittingly described by the French words, *encre de Chine*. This substance could easily be converted into an ink suitable for type-printing.

A practical press was already in use for the printing of wood-blocks. This press probably consisted of two upright wooden beams with a cross-piece, a bed, and a screw or spindle, to which was attached a bar or lever to exert the required pressure. The press was probably an adaptation of the simple contrivance employed in pressing out the grapes for the making of wine, or of the press used by the paper-makers of the fifteenth century.

The Inventor of Typography

Johann Gutenberg was a descendant of a highly respected patrician German family which called itself "Zum Gensfleisch." He was born in Mainz, Germany, about the year 1399. The original name of the inventor of printing from movable metal types in Europe was not Gutenberg, but *Hans* or *Henne zum Gensfleisch*. His father was *Friele zum Gensfleisch zur Laden zum Gutenberg,* a citizen of Mainz, who derived his name from the manor or estate of "Zum Gensfleisch," which his great-grandfather had acquired in Mainz during the year 1352. In 1386 Friele zum Gensfleisch married his second wife, Else Wirich, who was the daughter of the merchant Werner Wirich. Friele and Else resided in the manor-house "Zum Gutenberg," which was one of the properties of the large and influential Gensfleisch family. Henne called himself Gutenberg, after the name of the house in which he was born. Gutenberg's father died in 1419.

By his contemporaries the name of the inventor of typography was variously spelled Gutenberg, Guddenperk, Guettenbergk, Gudenburch, Guttenburgh, Gudenberg, and in other ways.

We know little of Gutenberg's childhood days. During the upheavals in the bishopric of Mainz and the entry there of the Emperor Frederick III, who confiscated the properties of the patrician families who had opposed him politically, the mother of Gutenberg and her son moved to Strassburg, where they lived as political exiles. Else von Gutenberg's son was first mentioned in a Strassburg document of 1420

as *Henchen* (little John), and again as *Henne,* in a manuscript record of 1427-28. In March, 1430, a decree which granted amnesty to "Henchen zum Gudenberg" and others not then living in Mainz was issued, but Gutenberg did not return to Mainz at once. He spent his early manhood days in Strassburg, and here he was interested in a number of ventures, including an association for the polishing of precious stones and the making of mirrors. Later, Andreas Dreizehn and Andreas Heilmann

FIGURE 2

Johann Gensfleisch, called Gutenberg.

From a medal by Léon Deschamps, issued by the French government mint.

also became members of the association. Gutenberg's business associates soon discovered that he was experimenting with some art which was not related to the making of mirrors.

Gutenberg's Activities in Strassburg

Dreizehn and Heilmann induced Gutenberg, in 1438, to make a five-year contract with them, upon the payment of 250 gulden to him, in which Gutenberg agreed to disclose to them "all his art and future discoveries." The contract further stipulated that, in case one of the three should die before the expiration of the contract-time, all the art, tools, and materials were to become the possession of the two remaining associates; and that the heirs of the deceased member of the tri-partnership

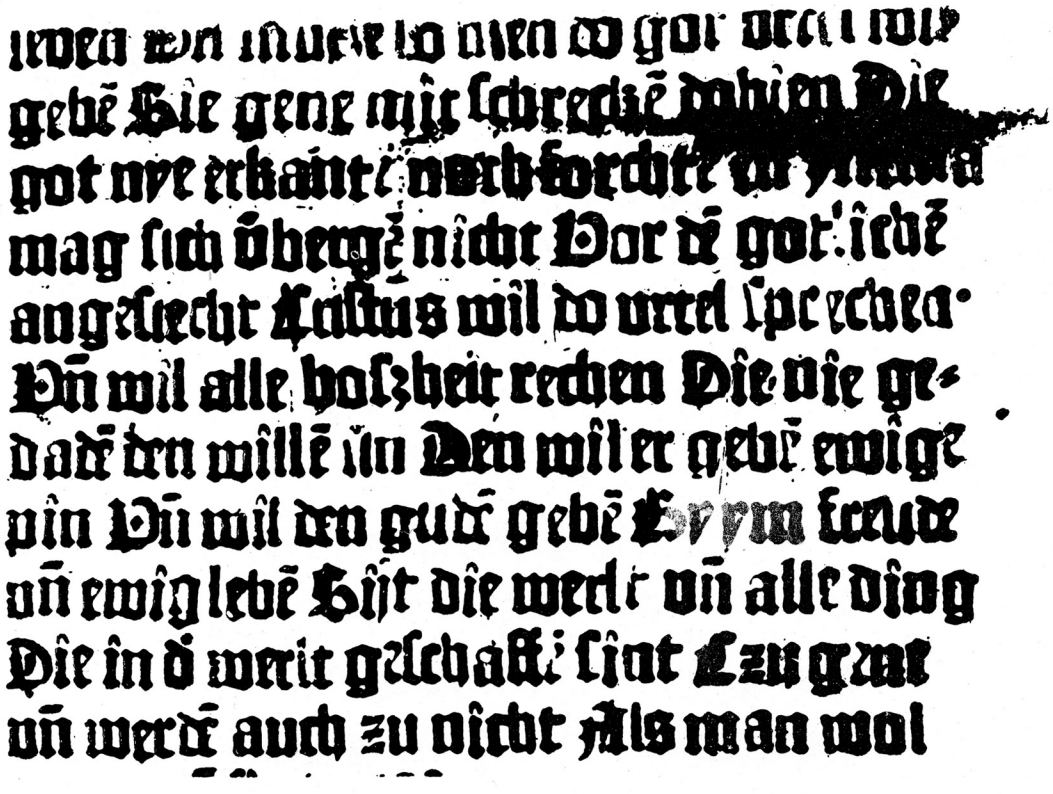


FIGURE 3

were to receive 100 gulden at the end of the fifth year. Andreas Dreizehn died before the end of the fifth year, being 85 gulden in arrears to Gutenberg. His heirs demanded admission to the tri-partnership; a lawsuit followed, and in the court proceedings the witnesses mention a press, made by the woodworker Konrad Sahspach, which was set up in the house of the deceased Andreas Dreizehn. After Dreizehn's death, Gutenberg had at once sent his servant, Lorenz Beildeck, to Klaus Dreizehn, the brother of the deceased, with the request to go to the press, take out and separate the four pieces (perhaps a sand-mold) by opening the two *würbelin,* and place the pieces on top of the [printing] press, so that no outsider would be able to ascertain or understand the purpose of the apparatus. A similar request was sent to the maker of the press by Andreas Heilmann. Andreas Heilmann testified that Gutenberg had sent his workman, Beildeck, to him and Dreizehn to get all the forms, and that these had been taken apart in his presence, one form being pied. The goldsmith (jeweler), Hans Dünne, testified that Gutenberg had paid him 100 gulden in 1436 for work done in relation to the art of printing.

These court records, although far from clear, show conclusively that Gutenberg and his two associates were actively engaged in experimenting with printing from movable types in Strassburg about the year 1438, if not before. Soon after this lawsuit Gutenberg probably moved to Mainz.

Gutenberg in Mainz

During the decade of 1440 to 1450 Gutenberg devoted much of his time to improving the technique of casting letters and printing from movable metal types. He produced a number of relatively small printed pieces, among them the *Judgment Day* sheet of 1444, a fragment of which was found in Mainz, in 1892, and is now preserved in the Gutenberg Museum in that city. The *Astronomical Calendar* for 1448, produced in 1447, found at Wiesbaden in 1902, is also an early Gutenberg piece. The *Judgment Day* fragment is shown, almost full size, in Figure 3, on the opposite page.

Printing the First Bible

Gutenberg's big plan, however, was the production of a large Bible. For this he required materials, paper, types, and the training of workmen not within the reach of his limited capital. About 1448 he convinced a citizen of Mainz, by name of Johann Fust, of the feasibility of

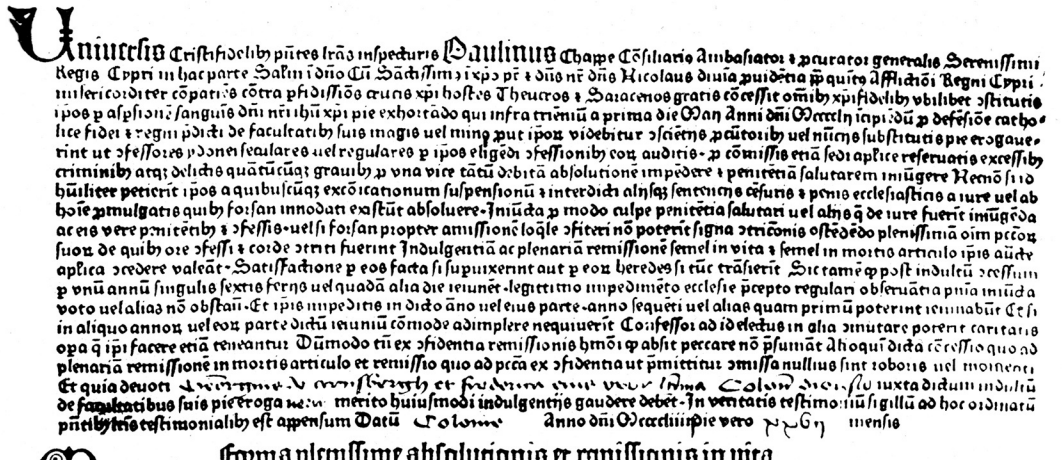
his plan to print a Bible. Fust lent him 800 gulden in 1450 to continue the printing of the Bible, but this amount was not sufficient to complete the work, and another 800 gulden was advanced in 1452, but this time under the proviso that Fust was to share in the profits of the sale of the Bibles. In 1454, the principal sum and the compound interest which Gutenberg owed Fust amounted to 2200 gulden. (A gulden may have had the monetary equivalent of $1.25 to $1.75, but its purchasing value was about equal to that of $10 to $15 today.) For one reason or another Fust brought suit against Gutenberg for the recovery of his loans, and Gutenberg was forced to withdraw in August, 1454. Most of the types, paper, and the nearly completed, but not yet bound copies of the *42-Line Bible* became the property of Fust. In this suit, Peter Schoeffer, who had been a dealer in manuscripts in Strassburg (where Gutenberg met him), and was employed by Gutenberg and Fust, was a witness. Upon Gutenberg's forced retirement, Schoeffer became Fust's business partner.

Dr. Paul Schwenke estimates that one copy of the Bible on vellum, unbound, and without rubrication and titles, had to be sold for at least 42 Rhenish guilders, in order to help pay for the entire parchment edition. (For 2438 large sheeps' hides Gutenberg and Fust paid 208 guilders.) Since it is recorded that handwritten parchment Bibles (they were generally sold unbound and unrubricated) brought only 60 guilders in Mainz and Strassburg at that time, it is unlikely that Gutenberg received more than 50 guilders for a complete copy of the *42-Line Bible.*

During the years that Gutenberg was associated with Fust, he did considerable experimenting, and about the beginning of 1454 he produced a font of type by means of an improved technique which employed steel punches and copper or bronze matrices, from which lead types were cast in an adjustable metal mold. Gutenberg's separation from Fust, in August, 1454, placed these new types in the possession of Fust and Schoeffer, and therefore Gutenberg had no opportunity to use them. These types made their first appearance in the *30-Line Letter of Indulgence,* which is shown in reduced size in Figure 4.

From Mainz Gutenberg went to Frankfurt-am-Main, where he had a married niece. With the aid of Dr. Konrad Humery, a syndic or advocate, he set up an independent type foundry and printshop and here he produced another font of type by means of the improved method of steel punches.

The first printing with these new types was the *31-Line Letter of Indulgence,* and the so-called *Türken-Kalender.*



Vniuersis Christi fidelibꝫ pñtes lrãs inspecturis Paulinus Chappe Cõsiliarius Ambasiator & procurator generalis Serenissimi Regis Cypri in hac parte Salm̃ in dño Cũ Sãctissim̃ i xpo pr & dñs nr̃ dñs Nicolaus diuina puidẽtia pp quinq; afflictõi Regni Cypri miserecorditer cõpatiẽs cõtra pfidissiõs cruces xpi hostes Theucros & Saracenos gratis cõcessit oĩibꝫ xpifidelibꝫ vbilibet ꝺstitutis ipos p aspsionẽ sanguis dñi nr̃i ihu xpi pie exhortãdo qui infra triẽniũ a prima die Man Anni dñi Mcccl incipiendũ p defensiõe catholice fidei & regni pdicti de facultatibꝫ suis magis uel minꝰ prout ipꝰ uidebit ꝺscientis procuratorib⁹ uel nũcijs substituis pie erogauerint ut ꝺfessores pdoni seculares uel regulares p ipos eligẽdi ꝺfessionib⁹ eor̃ auditis & cõmissis etiã sedi aplice reseruatis excessib⁹ criminib⁹ atq; delictis quãtũcũq; grauib⁹ p una uice tãtũ debitã absolutionẽ impẽdere & penitẽtiã salutarem iniũgere Necnõ si id humiliter petierit ipos a quibuscũq; excõicationum suspensionũ & interdicti alijsq; sentencijs cẽsuris & penis ecclesiasticis a iure uel ab hoĩe ꝓmulgatis quib⁹ forsan innodati existũt absoluere. Iniũcta p modo culpe penitẽtia salutari uel alijs q̃ de iure fuerit iniũgẽda ac eis vere penitẽtib⁹ & ꝺfessis uel si forsan propter amissionẽ loq̃le ꝺfiteri nõ poterit signa ꝺtritonis ostẽdẽdo plenissimã oĩm pcoꝝ suoꝝ de quib⁹ ore ꝺfessi & corde ꝺtriti fuerint Indulgentiã ac plenariã remissionẽ semel in vita & semel in mortis articulo ipis aũctr aplica ꝺcedere valeãt. Satisfactione p eos facta si supuixerint aut p eor̃ heredes si tũc trãsierit Sic tamẽ q̃ post indultũ ꝺcessum p vnũ annũ singulis sextis feriis uel quadã alia die ieiunẽt legitimo impedimẽto ecclesie pcepto regulari obseruãtia pnia iniũcta voto uel aliàs nõ obstãi. Et ipis impeditis in dicto ãno uel eius parte anno sequẽti uel aliàs quam primũ poterint ieiunabũt Et si in aliquo annoꝝ uel eor̃ parte dictũ ieiuniũ cõmode adimplere nequiuerit Confessor ad id electus in alia ꝺmutare poterit caritatis opa q̃ ipi facere etiã teneantur Dũmodo tũ ex ꝺfidentia remissionis hmõi q̃ absit peccare nõ ꝓsumãt alioquĩ dicta cõcessio quo ad plenariã remissionẽ in mortis articulo et remissio quo ad pcta ex ꝺfidentia ut ꝓmittitur ꝺmissa nullius sint roboris uel momenti Et quia deuoti [illegible] de facultatibus suis pie eroga[illegible] merito huiusmodi indulgentijs gaudere debẽt. In veritatis testimoniũ sigillũ ad hoc ordinatũ pñtibꝫ testimonialibꝫ est appensum Datũ Colonie Anno dñi Mcccliiij pie vero [illegible] mensis

ſforma plenissime absolutionis et remissionis in vita

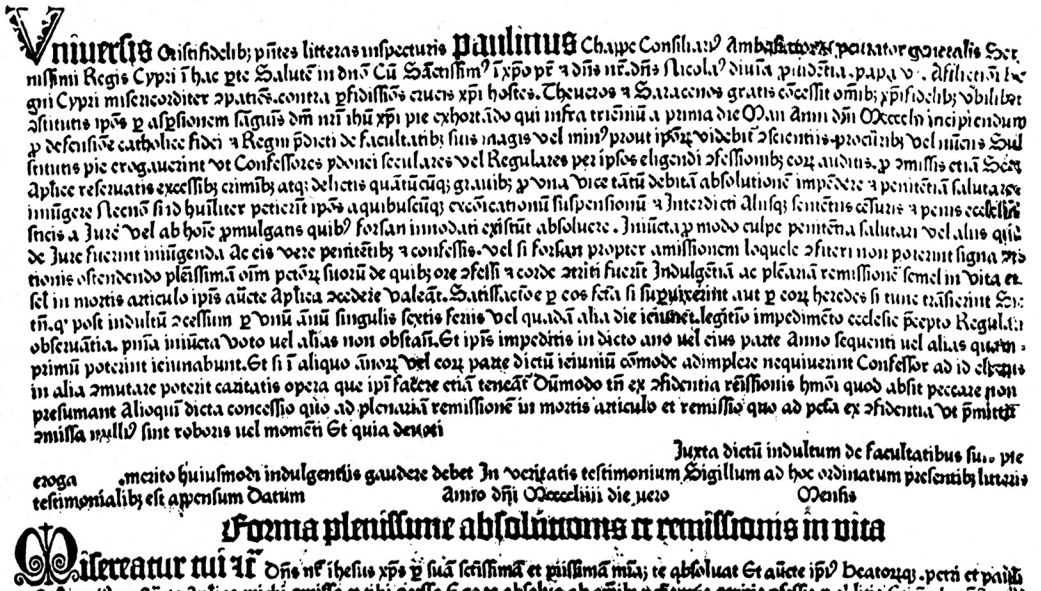
Miseretur tui aĩ Dñs noster ihesus xps p suã sanctissimã et pñissimã miã te absoluat Et aũcte ipis beatoriũq; petri & pauli aplorꝫ eiq; ac aũcte aplica michi ꝺmissa & tibi ꝺcessa Ego te absoluo ab oĩibꝫ pcis tuis ꝺtritis ꝺfessis & obliris Etiã ab oĩibꝫ casib⁹ excessib⁹ criminib⁹ atq; delictis quãtũcũq; grauib⁹ sedi aplice reseruatis Necnõ a quibuscũq; excõicationũ suspensionũ & interdicti alijsq; sentencijs censuris & penis ecclesiasticis a iure uel ab hoĩe ꝓmulgatis si quas incurristi dando tibi plenissimã oĩm pcoꝝ tuoꝝ indulgentiã & remissionẽ Inquãtũ claues sancte matris ecclie in hac parte se extendũt. In noĩe patris & filij & spiritus sancti Amen.

ſforma plenarie remissionis in mortis articulo

Miseretur tui aĩ Dñs noster ut supra Ego te absoluo ab oĩibꝫ pcis tuis ꝺtritis ꝺfessis et obliris restituendo te vnitati fidelium & sacramentis ecclesie Remittendo tibi penas purgatorij quas propter culpas & offensas incurristi dando tibi plenariã oĩm pcoꝝ tuoꝝ remissionẽ. Inquantũ claues sancte matris ecclie in hac parte se extendũt. In noĩe patris & filij & spiritus sancti Amen.

FIGURE 4

The *30-Line Letter of Indulgence.*



Vniuersis Christi fidelibꝫ pñtes litteras inspecturis **paulinus** Chappe Consiliarius Ambasiator & procurator generalis Serenissimi Regis Cypri i hac pte Salutẽ in dño Cũ Sãctissim̃ i xpo pr & dñs nr̃. dñs Nicolaus diuina pudẽtia papa v. afflictionũ Regni Cypri miserecorditer cõpatiẽs contra pfidissiõs cruces xpi hostes. Theucros & Saracenos gratis cõcessit oĩibꝫ xpifidelibꝫ vbilibet ꝺstitutis ipos p aspsionem sanguis dñi nr̃i ihu xpi pie exhortãdo qui infra triẽniũ a prima die Man anni dñi Mcccl incipiendum p defensione catholice fidei & Regni pdicti de facultatibꝫ suis magis vel minꝰ prout ipꝰ videbit ꝺscientis procuratorib⁹ vel nũcijs substituis pie erogauerint vt Confessores pdoni seculares vel Regulares per ipsos eligendi ꝺfessionibꝫ eor̃ auditis. p ꝺmissis etiã Sedi aplice reseruatis excessibꝫ criminibꝫ atq; delictis quãtũcũq; grauibꝫ p vna vice tãtũ debitã absolutionẽ impẽdere & penitẽtiã salutarem iniũgere Necnõ si id humiliter petierit ipos a quibuscũq; excõicationũ suspensionũ & interdicti alijsq; sentencijs cẽsuris & penis ecclesiasticis a Iure vel ab hoĩe ꝓmulgatis quibꝰ forsan innodati existũt absoluere. Iniũcta p modo culpe penitẽtia salutari vel alijs q̃ de Iure fuerint iniũgenda ac eis vere penitẽtib⁹ & confessis. vel si forsan propter amissionem loquele ꝺfiteri non potuerint signa ꝺtritionis ostendendo plẽnissimã oĩm pcoꝝ suoꝝ de quib⁹ ore ꝺfessi & corde ꝺtriti fuerũt Indulgẽtiã ac plẽnariã remissionẽ semel in vita et sel in mortis articulo ipis aũcte aplica ꝺcedere valeãt. Satisfactõe p eos fcta si supuixerint aut p eor̃ heredes si tunc trãsierint Sic tñ q̃ post indultũ ꝺcessum p vnũ ãnũ singulis sextis feriis vel quadã alia die ieiunẽt legitimo impedimẽto ecclesie pcepto Regularis obseruãtia. pnia iniũcta voto uel alias non obstãi. Et ipis impeditis in dicto ano uel eius parte anno sequenti uel aliis quam primũ poterint ieiunabunt. Et si i aliquo ãnoꝝ vel eor̃ parte dictũ ieiuniũ cõmode adimplere nequiuerint Confessor ad id electus in alia ꝺmutare poterit caritatis opera que ipi facere etiã teneãt Dũmodo tñ ex ꝺfidentia rẽissionis hmõi quod absit peccare non ꝓsumant Alioquĩ dicta concessio quo ad plenariã remissionẽ in mortis articulo et remissio quo ad pcta ex ꝺfidentia vt ꝓmittit ꝺmissa nullius sint roboris uel momenti Et quia deuoti

Juxta dictũ indultum de facultatibus su.. pie

eroga .meritõ huiusmodi indulgentijs gaudere debet In veritatis testimonium Sigillum ad hoc ordinatum pñtibꝫ litteris testimonialibꝫ est appensum Datum Anno dñi Mcccliiij die vero Mensis

Forma plenissime absolutionis et remissionis in vita

Miseretur tui aĩ Dñs nr̃ ihesus xps p suã sctissimã et pissimã miã te absoluat Et aũcte ipi beatorũq; petri et pauli aplorꝫ eiq; ac aũcte aplica michi ꝺmissa et tibi ꝺcessa Ego te absoluo ab oĩibꝫ pcis tuis ꝺtritis ꝺfessis & obliris etiã ab oĩbus excessibꝫ criminibꝫ atq; delictis quãtũcũq; grauibꝫ Sedi aplice reseruatis Necnon a quibuscũq; excoicationũ suspensionũ et interdicta aliisq; sijs cẽsuris & penis ecclasticis a Iure vel ab hoĩe ꝓmulgatis si quas incurristi dando tibi plẽnissimã oĩm pcoꝝ tuoꝝ indulgentiã & remissionẽ Inquãtũ claues sancte matris ecclie in hac pte se extendũt. In nomine patris & filij et spiritus sancti Amen.

Forma plenarie remissionis in mortis articulo

Miseretur tui aĩ Dñs noster ut supra Ego te absoluo ab oĩibꝫ pcis tuis ꝺtritis ꝺfessis & obliris restituendo te vnitati fideliũ & sacramentis ecclie Remittendo tibi penas purgatorii quas propter culpas et offensas incurristi dando tibi plenariam oĩm pcoꝝ tuoꝝ remissionẽ. Inquãtũ claues sce matris ecclie in hac parte se extendũt. In noĩe pris et filij et spũs sancti Amen.

FIGURE 5

The *31-Line Letter of Indulgence.*

The type for the *36-Line Bible* was also cast in the new establishment at Frankfurt, although some authorities say the book was printed by Pfister in Bamberg.

In 1465 Gutenberg accepted the honorary post of salaried courtier from the then reigning archbishop, Adolph von Nassau, whose residence was at Eltville. This post carried with it an annual allowance of corn and wine for Gutenberg's household in Mainz, and gave him the privilege of wearing a suit of livery and riding with the archbishop's court; but it required no labor.

During the next three years Gutenberg did very little printing, although he continued to manage his former shop, which was then in the possession of Dr. Konrad Humery.

Gutenberg died in February, 1468, at Eltville, and was buried in the Franciscan Church in Mainz, which, however, was destroyed by fire in 1793. The exact location of Gutenberg's grave is therefore unknown.

NOTE—Various dates have been assigned by leading authorities on printing history to Gutenberg's activities as the inventor of, and the first printer with, movable metal types in Europe. Gustav Mori's opinion (which is also the author's) has already been stated. Seymour de Ricci gives the years 1439 to 1467 as the period of Gutenberg's typographic activities; Dr. K. Haebler names 1444 to 1467 as the most likely years. Other writers give earlier or later dates.

Gutenberg's Personal Characteristics

Of Gutenberg's personal appearance we are not well informed, because no portrait of him which was made during his lifetime is in existence today. The first description of him, and perhaps the second picture, appeared in André Chevenot's *Les vrais portraits et vies des hommes illustres* (The true portraits and lives of famous men), which was published in Paris in 1584. Nearly all pictures which are supposed to represent Gutenberg's likeness are patterned after the illustration in Chevenot's book, and show him with a long, wavy beard. The long beard may be in harmony with the strong and distinguished face which bears it; but we now know that the men of the patrician families of the time during which Gutenberg lived did not wear beards. He was a man of powerful physique and fiery temper, great courage and determination. He was fond of wine and good food. While he lived in Strassburg, Gutenberg became engaged to a young lady by name of *Ennelin zur Isernen Tür,* the daughter of a patrician family of that city, who

afterwards sued him for breach of promise. Although Gutenberg lost this suit, as well as most of his property in Mainz, he continued to carry on his experiments in type-founding and printing with indefatigable zeal, until, in spite of all obstacles, he had given to the world the most important invention of all times.

Johann Gutenberg has been honored through the erection of statues, by many cities of Europe and also in the United States. Perhaps the most notable one of these is in Mainz. The sketch for this statue was made by the German painter Ludwig Lindenschmidt, and cast in metal by M. Croazatier in Paris, after the model of the Danish sculptor Thorwaldsen. It was placed in the Gutenbergplatz at Mainz, as decreed by Napoleon I, in 1804, but was not dedicated, however, until 1837.

Because photography, "the child of chemistry and optics," had not been born when Gutenberg lived we have no authentic picture of him. (It was not until 1835 that the first photographic image was made.) All sketches for statues and supposed likenesses of Johann Gutenberg (except one or two very late ones) are based upon André Chevenot's illustration, which shows him with a beard. There is a bronze head in the International Gutenberg Museum at Mainz, by the modern German painter and sculptor, Willi Reue, which shows the master-inventor without a beard.

How Gutenberg Made His Types

Printing from single movable metal types could not be accomplished without first discovering a method of casting such types. The important part of the invention of typography is therefore the technique of producing single metal types which could be assembled in lines, and which would impart an impression when covered with ink and brought in contact with paper, and at the same time be so durable that they could be used over and over again.

In the absence of any written account by Gutenberg himself, or by Fust and Schoeffer, there has always been a great deal of doubt as to just how the first movable metal types were made.

Herr Gustav Mori, the typographic historian and writer, of Frankfort-on-Main, Germany, who has done a great deal of painstaking research work, has accomplished more than anyone else to clear up the mystery as to how Gutenberg, and the first printers in Germany, made their types. Over a period of many years, Mr. Mori pursued investigations, aided by various colleagues and supported by the founders and

managers of the Stempel type foundry, in order to establish the technique and the mechanical operations employed by Gutenberg and his associates in producing the type for the first printed pieces and for the famous *42-Line Bible.*

Although the information which Mr. Mori has obtained is based largely upon circumstantial evidence, he has also made many me-

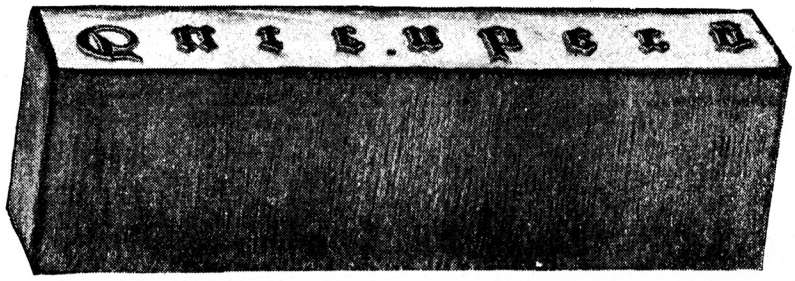


FIGURE 6

A wooden pattern for a sand-mold casting.

chanical tests in which the same procedures were followed that Gutenberg is likely to have followed in producing his printing types. Mr. Mori's deductions are therefore the result of actual experiments, which included the cutting of wood models, the casting of brass matrices and of lead types in sand-molds, and the printing from such types. In Haarlem, Joh. Enschedé en Zonen has conducted somewhat similar experiments with sand-mold types.

Even during the pre-Christian era the technique of casting metal coins had been developed by the Romans, and during the thirteenth

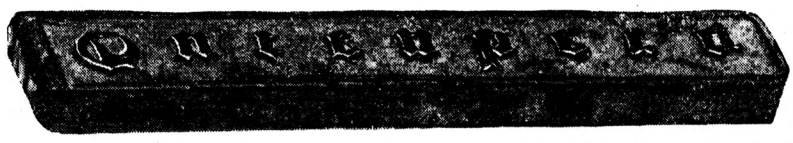


FIGURE 7

A rough brass casting, made from the wooden pattern.

century it enjoyed a high degree of perfection. Undoubtedly Gutenberg, in Germany, and Coster, in Holland, were familiar with the procedure of producing metal coins, and naturally they cast their first types in a sand-mold (which was probably made very much as such molds are made today in the foundry industry), by means of wooden patterns, impressed in sand. Into these depressions the melted lead was poured, and thus the single metal types were produced.

The casting technique of the sand-mold was applied also to the duplication of a class of wood-cuts known under the name of *Schrotdrucke,* and a number of prints made from these thin metal duplicate plates (already described in a paragraph in Chapter II) may be seen

FIGURE 8

The casting, cut apart, tooled, polished and ready for punching into lead blocks.

in the German libraries. These metal plates were tacked with nails onto a wood base to give them stability and raise them to printing height. (The nail-heads show in some of the prints.)

The method of casting lead types in a sand-mold was an important technical discovery in the invention of typography, but because of their mechanical shortcomings and imperfections these lead types could not be used to print a large number of sheets before they became worn and uneven, making replacement necessary; nor could they be cast rapidly

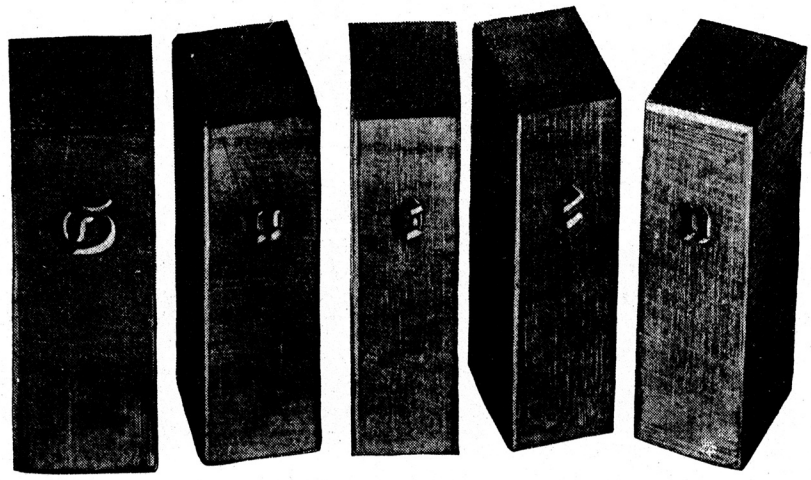


FIGURE 9

The lead blocks, each containing a character produced with a brass punch. The resulting matrices were used in a hand-mold for casting types.

enough and in sufficient quantities to make their use in book-printing commercially profitable. It may be stated, by way of explanation, that the soft-metal castings, produced in a sand-mold, cooled more rapidly at their outer edges than in the center, causing a contraction at the center. This made the sand-mold lead types slightly lower in the center

of the face of the letter than at its outer edges. The difficulty encountered in printing from such types can easily be imagined. The cost of producing anything but small printed pieces with such types was almost prohibitive.

The Adjustable Type-Mold

Between the years of 1445 and 1452 Gutenberg's untiring experiments enabled him to discover a method of casting single metal types

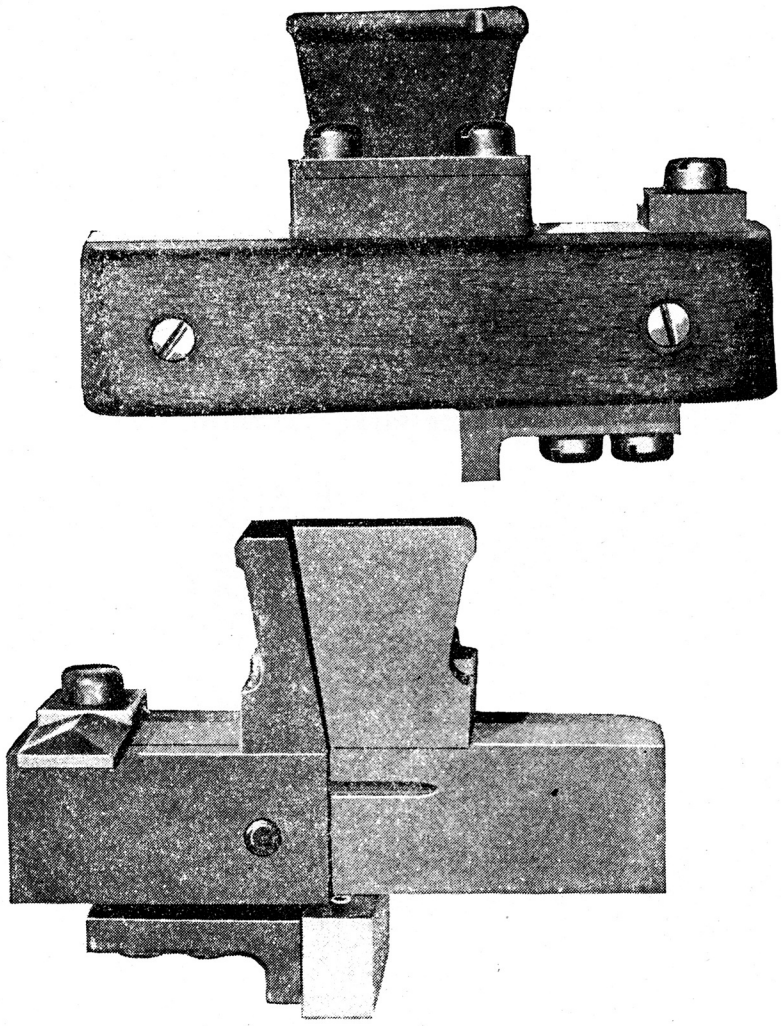


FIGURE 10

Two halves of an old hand-mold. The lower half shows a matrix in proper casting position.

in an adjustable metallic (brass or iron) mold through the medium of a brass or copper patrix or punch which was produced in a sand-mold. This was Gutenberg's most important technical invention pertaining to type-founding, because he was thereafter able to cast single metal

types having a face that was as high in the center as at the edges—a condition impossible to obtain with the lead types cast direct in a sand-mold. The adjustable and changeable metal type-casting instrument

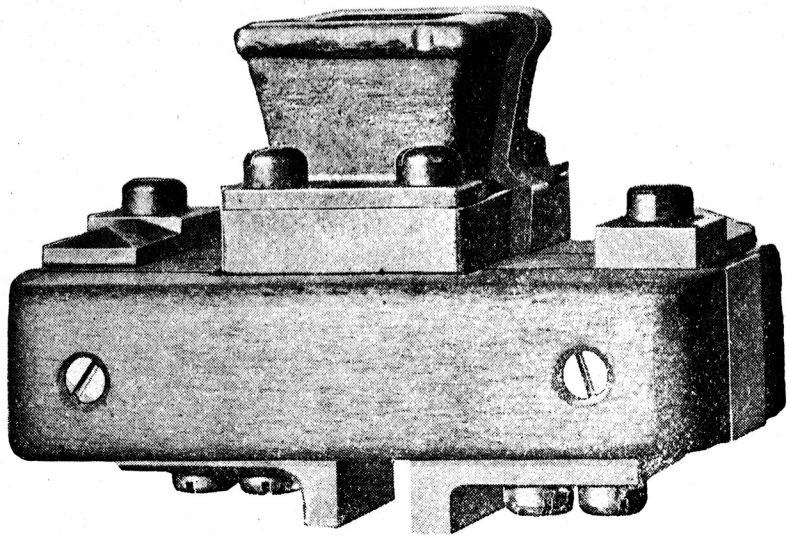


FIGURE 11

The mold shown in Figure 10, closed. The molten metal was poured in at the top.

made it possible to cast letters of varying width with the same apparatus, in unlimited quantities; letters of uniform height and body-size. This was the *real invention of typography*.

Gutenberg, as type-founder, was then, about 1450, able to perform, or have performed, the following operations:

Draw on wood of suitable hardness, perhaps boxwood or pear-tree wood, the characters or letters, and cut or engrave, in relief, the models

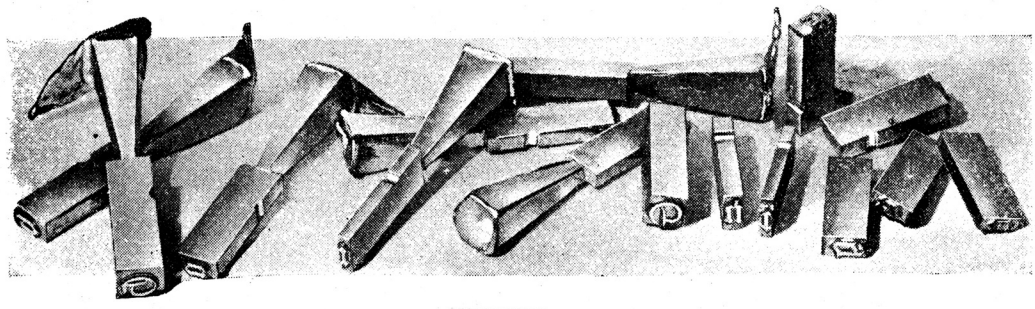


FIGURE 12

A group of types, with and without the jet, cast in a hand-mold.

or patterns for the letters. With these wood models he cast brass letters in sand; the rough casting was finished and smoothed and the letters carefully trimmed to hold their shape; they were then cut apart and

used as punches. By driving the brass punches (patrices) with a hammer into small soft lead blocks, rough matrices were obtained, which were tooled and *justified* in order to make them accurate and to fit his type-mold.

Even as early as 1740, a technician of the Egenolff-Luther type foundry at Frankfurt recognized the discovery of type-cutting or type-casting as the most important part of the invention of typography. He regarded the *ars impressoria* (art of impressing or printing) only as a direct result thereof.

The Works of Gutenberg

The different pieces of printing ascribed to Gutenberg by the German biographers vary in number. The earliest piece of printing from movable metal type in existence today, is a fragment of the sibylline (prophetic) poem in Old German treating of the Judgment Day or *Das Welt-Gericht*. This is now preserved in the Gutenberg Museum at Mainz. Its approximate date is 1444-1445. It is printed on both sides of the sheet, from the so-called "Urtype," or first types produced by Gutenberg, the font of which contained no tied letters or ligatures.

As Gutenberg did not print dates upon his works, it is impossible to determine how many pieces appeared before or after the printing of the Judgment Day sheet. The first printed work ascribed to Gutenberg which establishes a date is the *Astronomical Calendar* for the year 1448, which must have been printed in 1447. This is now in the library at Wiesbaden.

The Gutenberg donatus, which is in Paris, is thought to have been produced during the same year, but further research work is needed in order to establish the details.

Another piece, said to have been produced by Gutenberg, is the *Missale Speciale Constantiense*. It is an abbreviated mass-book of 192 pages, printed for the bishopric of Konstanz, about 1450-1454, in Mainz. Several copies are in existence, one of them in Zürich, Switzerland.

Then follows the *30-Line Letter of Indulgence* or *Ablassbrief*, produced with the new steel-punch types, cut by Gutenberg, just before he separated from Fust, in 1454. The printing of this was probably finished by Fust and Schoeffer.

In the *31-Line Letter of Indulgence* or *Ablassbrief*, the type-face later used in the *36-Line Bible* makes its first appearance. This sheet was printed with the steel-punch types which Gutenberg cut in Frankfurt.

~~Eyn manūg d̄ crīſtēheit widd̄ die durchē~~

Almechtig̃ kōnig in himels tron
Der vff ertrich ein dorne crone Vñ
ſin criſt baner vō blude roit Das heilge
crutze in ſterbend̄ not Selb̄ hat getragē
zu d̄ mart̃ groſs Vñ dē bittē dot nackt
vñ bloſs Dar an vmb mentſchlich heil
gelittē Vñ vns do mit erloſt vñ erſtrittē
Vñ den boſē fyant vb̄ wūden Hilff vns
vorbas in allē ſtūden widd̄ vnſer fynde
durchen vñ heiden Mache en yren boſen
gewalt leidē Den ſie zu cōſtantinopel in
kriechē lant An manchē crīſtē mentſchē
begangē hant Mit fahen martin vñ dot
ſlagē vñ ūſmehē Als den apoſteln vor
zīſtē iſt geſcheen Vmb die xij ſtucke des
heilgen glaubē gut Halt xij die gulden
zale in hut Auch werden dis iar xij nu-
wer ſchin Viſiteren die xij zeichē des him
mels din Als mā zelet noch din̄ geburt
offenbar M◆ccc◆lv◆iar Siebē wochē

FIGURE 13

The first text-page of the *Türken-Kalender* pamphlet. From a copy produced with the reconstructed Gutenberg types of D. Stempel Co., Frankfurt. In the original the heading has a red line running through it, and the initial is also in red.

A specimen which is preserved at The Hague bears a manuscript notation that it was sold at Erfurt on the 22d of October, 1454. This Indulgence sheet, about 11 by 7 inches in size, and printed on one side only, was issued by Pope Nicholas V.

Only one complete specimen of the so-called *Türken-Kalender* for 1455 (a warning to Christians by the then ruling Pope to check the approach of the Turks) is preserved. It is in the Bavarian State Library at Munich. This was issued in December, 1454. It has twelve pages, about 7¼ by 10⅛ inches, nine of the pages containing text-matter, and is the first pamphlet printed entirely in German. A fragment of the same calendar is in the library at Berlin.

The most notable work of Gutenberg is the famous *42-Line Bible.* This Bible was first brought to the attention of the world by the copy discovered and enthusiastically described by the French bibliographer DeBure, in 1763, over 300 years after it was printed. The Bible, bound in four volumes, in red morocco leather, is stamped with the arms of Louis XIV, and bears a manuscript date of 1456. It is sometimes called the *Mazarin* Bible, because it was found in the former Hotel Mazarin, in the library of Cardinal Mazarin. This building now houses the French national library or Bibliothèque Nationale, in Paris.

The *42-Line Bible* is supposed to have been printed at Mainz by Gutenberg and his associates in 1453-1455. It consisted of 641 printed leaves or 1282 pages in folio size (11½ by 15 inches), without printed numerals, signatures or catch-words. There were two editions, one on hand-made paper of fine quality and texture, of which about 150 copies were produced; of the other edition, on vellum, about 30 copies were printed. There are only 45 copies on paper, and 13 copies on vellum in existence today. The paper used has a watermark of a bull's head with a star and a bunch of grapes. Although the lengths of the type-pages are practically the same, the number of lines (two columns to the page) vary. On pages 1 to 9 there are 40 lines; page 10 has 41 lines. All the other pages have 42 lines; hence the name *42-Line Bible.* As every purchaser of a Bible in early days had it bound to suit himself, the existing *42-Line Bibles* are bound in two, three, or four volumes. In some of the copies, the *rubrics* or red letters were printed in by running the sheets through the press a second time. In the Vollbehr volumes the first letters of each book and chapter are painted in colors, and the marks of differentiation between words are added in red cinnabar, as are also the titles. On the upper margins of the pages the names of the books

FIGURE 14

A page from the *42-Line Bible*. The original is in the British Museum.

are written in with a pen dipped in cinnabar, but shaded with blue. The pages are without numbers, catch-words or catch-syllables.

Among the Gutenberg Bibles on vellum in existence today, the three volumes owned by Dr. Otto F. Vollbehr of Berlin, Germany, and

those in the Bibliothèque Nationale, in Paris (four volumes), are the finest and most valuable. All are perfect and complete. Dr. Vollbehr, who acquired his Bible from the old abbey of St. Blasius, in a valley of the Carinthian Alps, is said to have paid the enormous sum of $305,000 for it, in 1926. The British Museum has two perfect and complete volumes, as has also the Hofbibliothek at Aschaffenburg, Germany. The Buchmuseum at Leipzig and the Universitäts-Bibliothek, in the same city, each have a two-volume Bible of which one leaf is missing, but otherwise perfect. The Huntington Library at San Gabriel, Cal., and the Staats-Bibliothek at Berlin, Germany, each have two excellent volumes in which two leaves are missing. The Morgan Library, New York City, has two volumes, of which four leaves are missing. The Vatican Library, at Rome, has two volumes, six leaves missing. The Universitäts-Bibliothek at Göttingen has two complete volumes which are imperfect. The Archiepiscopal Library, London, has one volume; Old Testament missing. The Landes-Bibliothek at Fulda has one volume; New Testament missing. This accounts for all the Bibles printed on vellum still extant. In addition to these, there are about sixteen cities in which parchment fragments of the *42-Line Bible* are located. The most important of these fragments, comprising sixteen disconnected leaves, is in the Royal Library at Stockholm, Sweden. The other places are: Mainz, Berlin, Augsburg, Dresden, Frankfort-on-the-Main, Hannover, Nürnberg, all in Germany; London, Dublin, Cambridge; Providence, R. I., and Jersey City, N. J. About a half-dozen fragments are still in the hands of book dealers.

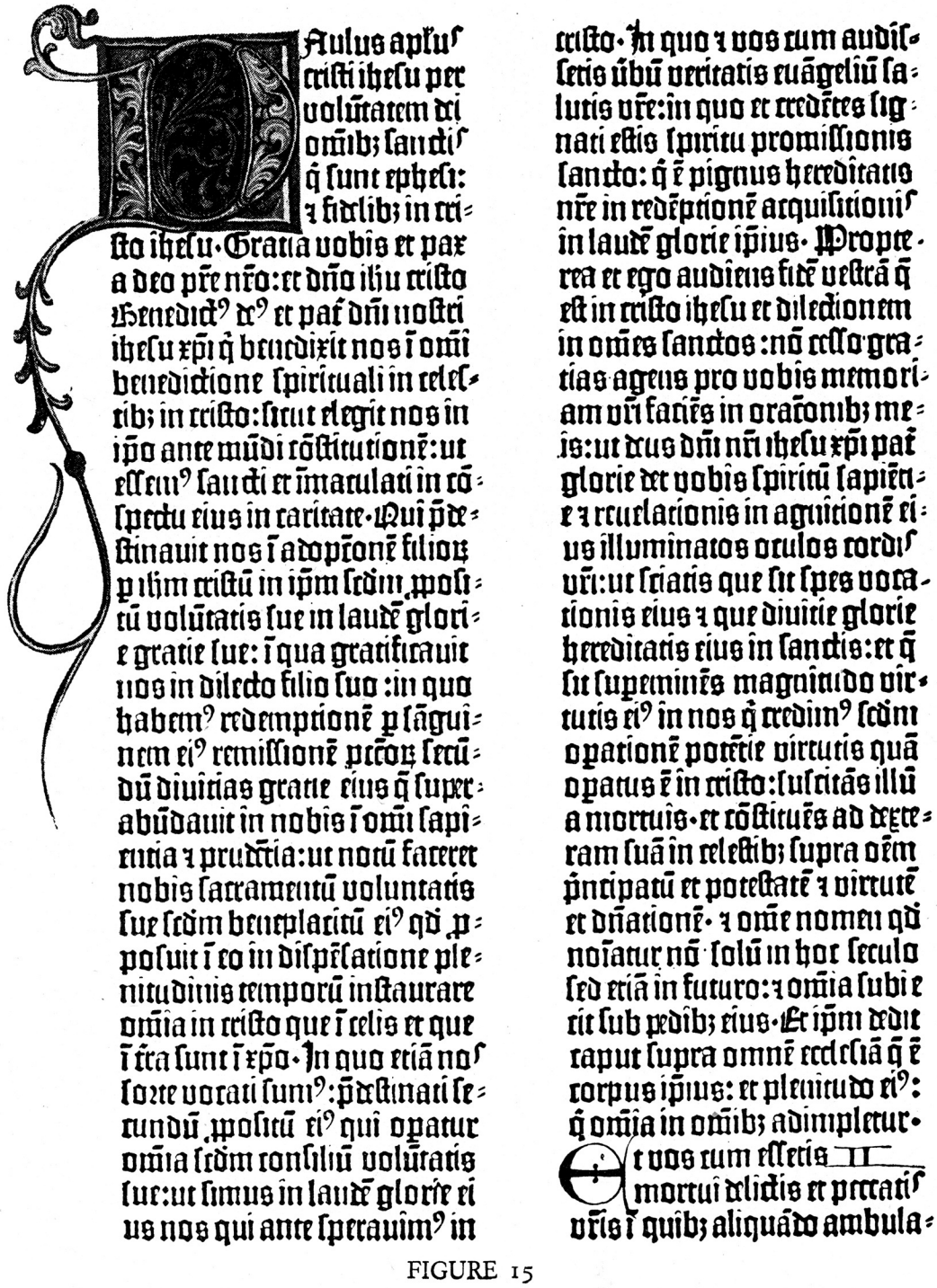
The forty-five copies of the *42-Line Bible* printed on paper are located in various libraries, museums, and in private collections in Europe and the United States.

The types used in the *42-Line Bible* were cast in a hand-mold from brass matrices, and their size was about equal to *20-point* under the point system.

A general term applied to any piece of printing or book produced from movable metal type during the fifteenth century is *incunabula;* plural, *incunabulae.* This word comes from the Latin and indicates that the book or object dates from the period when the art was in its infancy. The German equivalent is *Wiegendrucke* (cradle-prints or cradle-printing).

Gutenberg's second book was the *36-Line Bible,* which was probably printed in 1458, with the types used in the *31-Line Indulgence* and also

in the *Türken-Kalender*. Although this Bible was printed with the steel-punch types of Gutenberg, he may have been aided by Albrecht Pfister of Bamberg in the execution of the work. Only ten copies of this



Paulus apl'us
cristi ihesu per
volūtatem dei
oīb; sanctis
q̄ sunt epheſi:
et fidelib; in cri-
sto ihesu. Gratia vobis et pax
a deo pr̄e nr̄o: et dño ihu cristo
Benedict⁹ deꝰ et pat̄ dñi nostri
ihesu xp̄i q̄ benedixit nos i oī
benedictione spirituali in celes-
tib; in cristo: sicut elegit nos in
ipo ante mūdi cōstitutionē: ut
essemꝰ sancti et imaculati in cō-
spectu eius in caritate. Qui p̄de-
stinauit nos i adoptionē filioꝝ
p ihm cristū in ipm scdm ꝓpo-
situ voluntatis sue in laudē glori-
e gratie sue: i qua gratificauit
nos in dilecto filio suo: in quo
habemꝰ redemptionē p sāgui-
nem eiꝰ remissionē pcoꝝ secū-
dū diuitias gratie eius q̄ super-
abūdauit in nobis i oī sapi-
entia et prudētia: ut notū faceret
nobis sacramentū voluntatis
sue scdm beneplacitū eiꝰ qđ ꝓ-
posuit i eo in dispsationē ple-
nitudinis temporū instaurare
oīa in cristo que i celis et que
i tra sunt i xp̄o. In quo etiā nos
sorte vocati sumꝰ: p̄destinati se-
cundū ꝓpositū eiꝰ qui operatur
oīa scdm consiliū voluntatis
sue: ut simus in laudē glorie ei
us nos qui ante speauimꝰ in
cristo. In quo et vos cum audis-
setis verbū veritatis euāgeliū sa-
lutis vr̄e: in quo et credētes sig-
nati estis spiritu promissionis
sancto: q̄ ē pignus hereditatis
nr̄e in redēptionē acquisitionis
in laudē glorie ipius. Propte-
rea et ego audiens fidē vestrā q̄
est in cristo ihesu et dilectionem
in oēs sanctos: nō cesso gra-
tias agens pro vobis memori-
am vr̄i faciēs in oracionib; me-
is: ut deus dñi nr̄i ihesu xp̄i pat̄
glorie det vobis spiritū sapiēt-
e et reuelationis in agnitionē ei-
us illuminatos oculos cordis
vr̄i: ut sciatis que sit spes voca-
tionis eius et que diuitie glorie
hereditatis eius in sanctis: et q̄
sit supereminēs magnitudo vir-
tutis eiꝰ in nos q̄ credimꝰ scdm
operationē potētie virtutis quā
operatus ē in cristo: suscitās illū
a mortuis. et cōstituēs ad dexte-
ram suā in celestib; supra oēm
pncipatū et potestatē et virtutē
et dñationē. et oīe nomen qđ
noīatur nō solū in hoc seculo
sed etiā in futuro: et oīa subie
cit sub pedib; eius. Et ipm dedit
caput supra omnē ecclesiā q̄ ē
corpus ipius: et plenitudo eiꝰ:
q̄ oīa in oīb; adimpletur.
Et vos cum essetis
mortui delictis et peccatis
vr̄is i quib; aliquādo ambula-

FIGURE 15

A page from the *36-Line Bible*. (The first page of the Second Epistle of St. Paul to the Corinthians.)

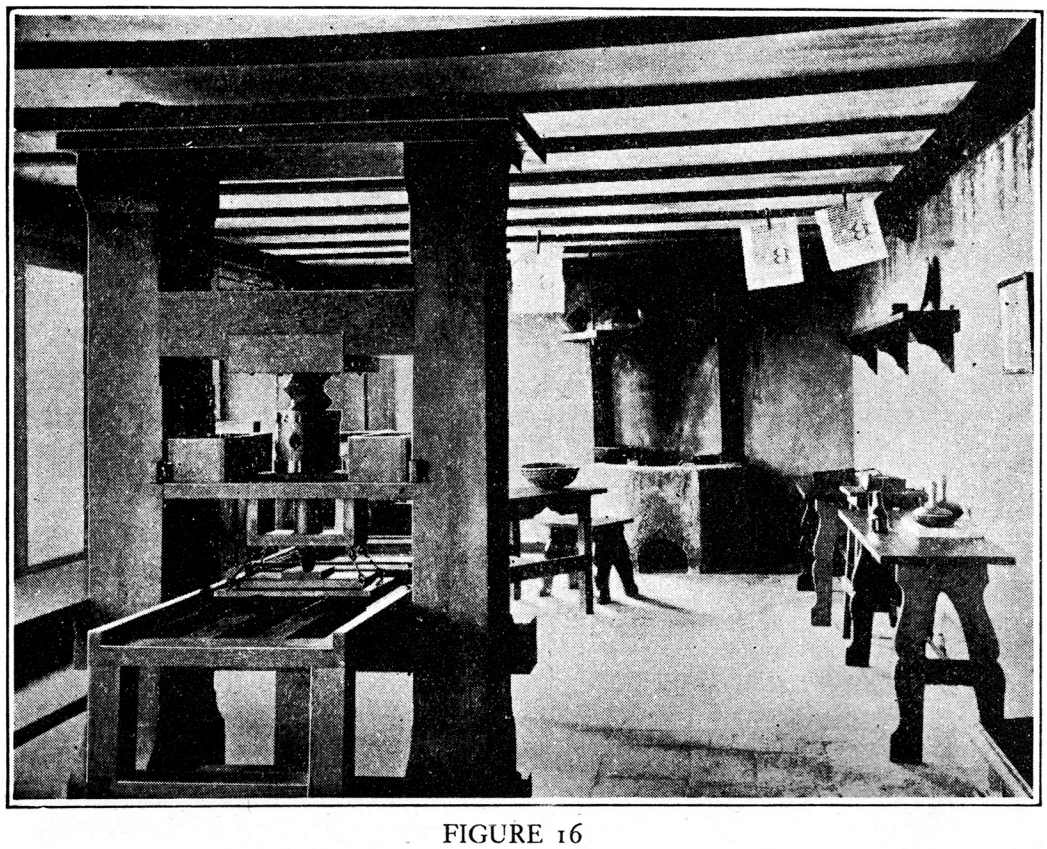


FIGURE 16

Gutenberg's press and printshop, as reconstructed by Herr Gustav Mori, and installed in the Gutenberg Museum at Mainz.

Bible are known to be in existence—one in England, one each in Belgium and France, the others in Germany.

The other printed works supposed to be from Gutenberg's press are the *Catholicon* of 1460 (a Latin encyclopedic dictionary by Johannes Balbus), several donatuses, broadsides, calendars, etc.

The question may arise in the reader's mind, "Where did Gutenberg and his successors obtain their type-designs, and why did they select such illegible ones?" The answer is, that to the people of Gutenberg's time his type-faces were not illegible, because they were accustomed to read such letters, if they could read at all. Gutenberg and his successors, just as the cutters and printers of wood-blocks, copied and imitated the letter-designs which they saw in the manuscript Bibles and other written books. The fifteenth century was within the so-called Gothic period, and the prevailing handwriting in Germany, and in certain other countries, was *black-letter*. The scribes used a heavy form of black-letter, with accompanying capitals, and these are correctly called *Gothic*. It will be interesting to compare some of the illustrations in Chapters I and II,

but especially the block-prints and books, with Figure 7 of Chapter I (the Salzburg manuscript Bible of 1428), and finally, with the illustrations of the works of Gutenberg shown in this chapter.

NOTE—Several of the paragraphs in this chapter are translations from Gustav Mori's book, *Was Hat Gutenberg Erfunden* (What Did Gutenberg Discover), and the author gives due credit for this source of information. Several of the illustrations for this chapter were also furnished by Mr. Mori. The illustrations in Figures 6, 7, 8, 9, 10, 11, 12, and 16 are from exhibition material furnished by Mr. Mori to the Mergenthaler Linotype Company, and are reproduced by permission.

Laurens Janszoon Coster

In Haarlem, Holland, Laurens Janszoon Coster, whose death occurred in 1440, is said to have cut letter-models in wood, and cast metal types from them. No date is given to this event, but in a public square in Haarlem there is a statue of Coster, and the inscription on it states

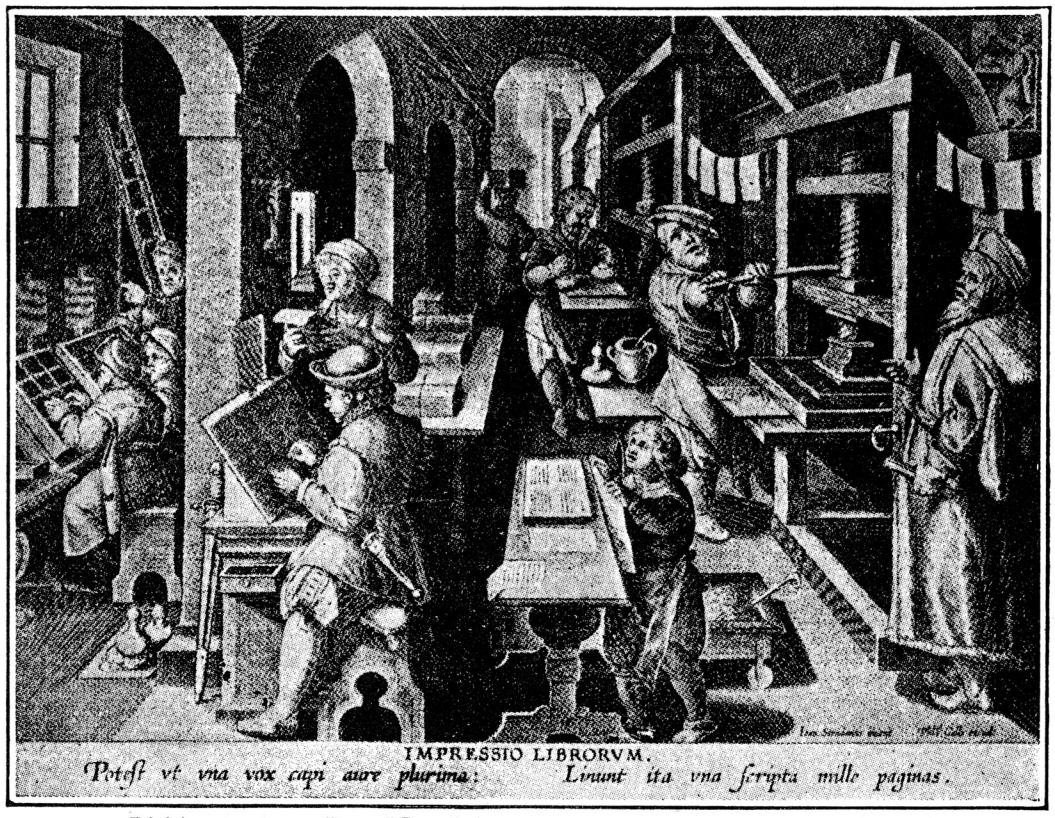


FIGURE 17

A sixteenth-century printshop, as it was shown in a copperplate engraving by Philipp Galle, in Johann Stradanus' *Nova Reperta*, 1575.

that he invented printing from movable letters in 1423. This inscription runs thus: *Laurentius Ioannis-Filius Costerus. Posuerunt cives neerlandici.* MDCCCLVI. *Typographiae Litteris mobilibus e metallo fusis inventor.* It is very probable that Coster or someone else experimented and printed block-books in Holland. It is also probable that experiments were conducted early during the fifteenth century with the casting of single metal types, but of this there is no definite evidence from which a date can be adduced. There is in Haarlem and other Dutch cities a group of about fifty books and fragments, in eight different styles of types. These books, which include a *Speculum Humani Salvationis,* printed partly from type, partly from wood-blocks, numerous editions of the Latin grammar of Ælius Donatus, and the *Doctrinale* of Alexander Gallus, have been called "Costeriana" and very early dates have been attributed to them. So far as the printing from metal types is concerned, there is no evidence that any was done in Holland until 1471. The first two Dutch printers who placed their names and the year during which they printed in their books were Katelaer and Liempt, of Utrecht, 1473. It is safe to assume, however, that the printing of wood-blocks and block-books was practiced in Holland either before, or contemporaneously with, this method of printing in Germany. It is probable that there was printing from movable letters as early as 1460.

The Dutch authorities, and also certain other biographers, agree that Coster must have been the first person to print from movable metal types, because the Dutch books are more primitive than those produced at Mainz. Mr. J. van Krimpen, of Enschedé en Zonen, Haarlem, considers the opinion expressed by Mr. Updike in *Printing Types,* Vol. 1, Chapter I, as safe and sound. The author quotes here a few lines from Mr. Updike's book: "Whether or no Coster was the first man to employ movable types, there certainly existed in Holland before Gutenberg's time, a series of books of primitive workmanship printed from type, and the roughness of the typography of some of the later printers—like Caxton—is considered one proof that a group of men were under the influence of this Dutch school of printing. It has always puzzled the casual student of *incunabulae* to account for the perfection of the books printed by Gutenberg; but if it is true that Gutenberg did not originate printing from movable types, but simply greatly improved the whole practice of making them, then we can see that the early and crude typography of Holland was merely the sub-structure on which Gutenberg so splendidly built."

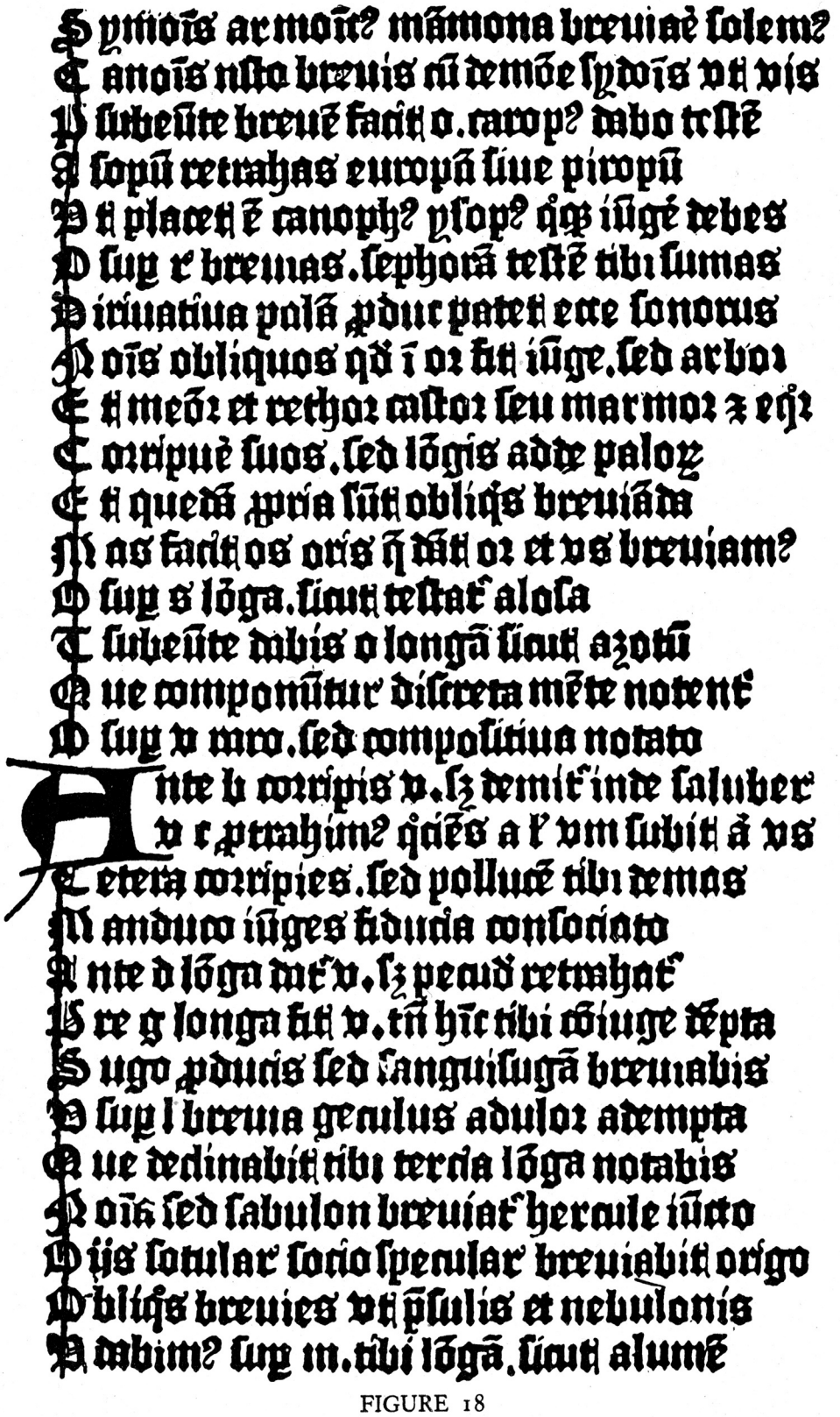


FIGURE 18

A page from a *Doctrinale* of Alexander Gallus. Of Dutch origin, but date and printer are unknown. Original in the British Museum.

The early Dutch technique of casting single movable metal types was somewhat different from that which Gutenberg first used. It consisted of wood models with which merely the head or face of the letters were cast in a sand-mold. These short types (about ¼ inch high) were then mounted on stems or on a base before they could be printed. It was not until about thirty years after Gutenberg had invented the adjustable metal type-mold that the Dutch printers began to date their books.

Chinese Claim to the Invention of Printing

Fêng Tao is usually regarded by the Chinese as the inventor of printing. A century or more after the beginning of block-printing, he improved the art and applied it to new uses. Fêng Tao occupies much the same place in Chinese history that Gutenberg holds in that of Europe. "But the printing on which the Renaissance of the Sung era was based, . . . is printing from wooden blocks. The invention of xylography, then, or block-printing, is the truly significant form of the invention in China," says Thomas F. Carter, Ph.D., in *The Invention of Printing in China and Its Spread Westward*. The Sung dynasty lasted from 960 to 1280 A.D.

About the year 960 A.D. experiments were made in China with printing from metal blocks instead of wood.

Mr. S. Wells Williams, LL.D., in *The Middle Kingdom,* says: "The honor of being the first inventor of movable types undoubtedly belongs to a Chinese named Pi Shêng, who lived about 1000 A.D. Pi Shêng is said to have printed books nearly four hundred years before the practice of typography in Mainz."

Pi Shêng, who was a man of the common people, is said to have been the first person to make movable types. During the period of 1041-1049, he utilized a plastic clay which he rolled into a soft plate. On its surface he cut or modeled the characters, so that each formed a single type, or rather *logotype*.[1] The symbols were cut apart and baked in fire to harden them. The porcelain types were then assembled in a metal frame, the bottom of which had been previously covered with a cement wax, consisting of pine-resin, wax, and paper ashes. After the types had been carefully aligned between partitions, the frame was placed over or near

[1] It must be recalled here that the Chinese language is not an *alphabetic* but an *ideographic* language. Each character or symbol represents a complete idea, and, although these ideograms may be vocalized as words or syllables, there are no single letters in the Chinese language which represent sounds, as in the English language.

the fire to soften the cement, and thus the types were stuck down. The frame was then taken away from the fire and allowed to cool, the types being leveled with a smooth board. The printing was done by rubbing, and when completed, the types were loosened by melting the cement, and made clean for distribution, and later, for reassembling for another printing.

Neither the clay types nor the types of tin, strung on a wire, that followed them, gained very wide use. Later copper types were used. The wooden types, described by Wang Chêng in 1314, were more successful. So far, however, all Chinese printing was by rubbing, not by impression.

Thomas F. Carter says: "The invention of the type-mold and the use of metal types is first heard of in Korea, and books printed from metal types appeared in large numbers there during the whole of the fifteenth century. The earliest record of type-casting dates from 1403, and the earliest extant book from 1409." The Koreans did not cast single types, but logotypes or syllables, because their language consists of ideographs. Nor did they use a press, but, like the Chinese, they obtained the impression on paper by the rubbing method.

CHAPTER IV

TYPE CASES

Although it is true that much of the composition of type which is used in the production of printed matter is done on type-setting or type-casting machines, it is equally true that composing machines have not, and probably never will, entirely replace the compositor and hand composition. There will always be a great deal of composition which can be better done by hand than by machines. But even when machine composition is utilized instead of hand composition, the operator of the machine is usually a person who has a good general knowledge of hand composition, because training in hand composition is a prerequisite for good machine-keyboard operation, and mechanical type-setting.

Hand composition means *setting type* by hand. It is the operation of taking individual letters, spaces, and punctuation marks or other characters from the type case and placing them in a composing stick in such a manner that when the type characters are properly assembled they form words, sentences, and paragraphs.

Before it is possible to set or compose type in a practical way, it becomes necessary to have the type, systematically arranged, in easily accessible trays or boxes. These trays are called *type cases*.

The type case is a shallow wooden tray divided into compartments of various sizes. There are about thirty styles of type cases, and some of these are made in different sizes. The most common, or standard, size is 32¼ by 16⅝ inches, outside dimensions, and 1⅛ inches deep, inside. Type cases for ordinary hand composition are usually laid out according to one of three plans or schemes: (*a*) All characters in one case; (*b*) capitals, small capitals, and a few other characters in one case; (*c*) the small letters, figures, points, spaces, and quads in another case. The two latter cases form a pair and would nearly always be used together.

The California Job Case

Of these three styles, the California job case is the one that is most frequently used. It has 89 compartments, the capitals occupying about

one-third of the area of the case. The standard-size job case will hold about twenty-five pounds of type, spaces, and quads. The California job case is the most practical one in America because it provides, in a convenient single tray, enough boxes for a complete font of type for ordinary composition of English words.

In England, and on the Continent of Europe, even the cases used for the English language are somewhat different in their layout from the cases which we use.

From the illustration shown on this page it will be seen that the capitals J and U do not follow in their alphabetical order. The reason for this is that the first fonts of type were made for setting up Latin copy and these letters were not part of the Latin alphabet. When the early

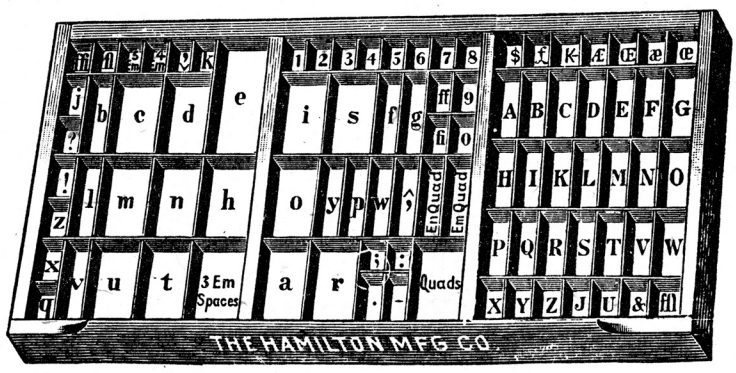


FIGURE 1

California job case.

printers made their case plans, the sounds of I and J were represented by the same character, and even after the introduction of J into the English dictionary, words containing these letters were, until comparatively recent times, classed together. U is a cursive form of V, and both were formerly used interchangeably. Later, when J and U were used to express distinctive sounds, they were added to the case in the lower part, as shown in the diagram.

Cases in Pairs

The oldest scheme of case-layout consists of two cases or a pair of cases, and these are placed one above the other on an inclined frame. That is, the case containing the capitals is above, the one with the small letters below. The terms *upper-case* and *lower-case* letters are derived therefrom. The plan of the usual capital case is a simple alphabetical order of the letters, with the exception of the J and U. The capital case

is divided into two sections, each having seven boxes across and seven boxes in a vertical line—forty-nine in each half of the case. Of the seven horizontal rows, only the lower four rows are used for letters, the upper

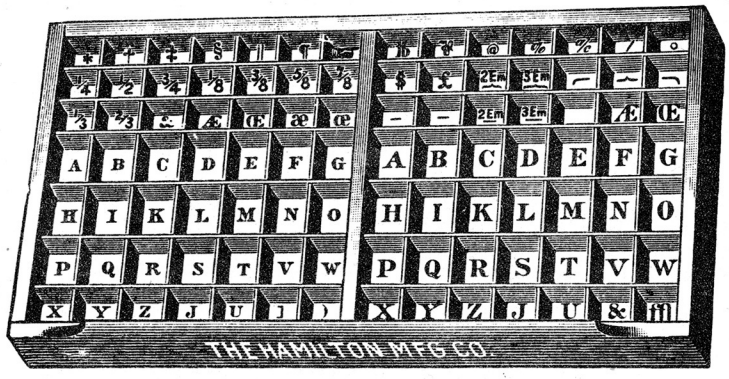


FIGURE 2
Upper case (capitals).

boxes being used for miscellaneous characters, or in some cases left vacant. These boxes will each hold five ounces of capital letters, or six ounces of every other sort usually placed in the left side of the upper case.

Plan of the Lower Case

The arrangement of the boxes in the lower-case plan differs from that of the capital case; the letters do not lie in alphabetical order, but are placed with due regard to their frequency of use; those letters which are

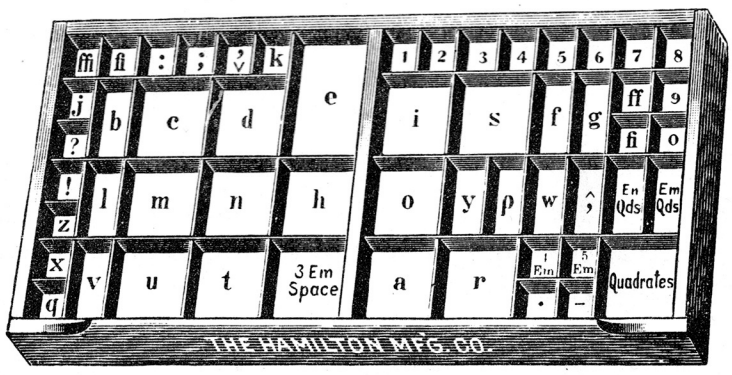


FIGURE 3
Lower case (small letters).

used most have the largest boxes, and those which are used rarely have the smallest boxes. The boxes nearest to the compositor as he stands before the case contain the letters most frequently used, like a, r, t, u, o, h. n, e, etc.; the types less frequently used are kept farther away. In the

main, the *lay* of these pairs of cases is nearly the same as it has been for about a hundred years in all countries where the English language and roman letters are used.

Changes in Plan of Cases

In many composing rooms the lay of the case as shown in Figures 2 and 3 is not strictly adhered to. The changes in the capital case occur in the last three rows, where the J takes the place of K, and all letters fol. lowing are placed in alphabetical order. This arrangement makes it easy for the apprentice to memorize the location of the letters on the capital side of the case.

Improved Job Case Layout

In the accompanying diagram (Figure 4) two changes from the plan of Figure 1 are shown. These changes are a decided improvement. It

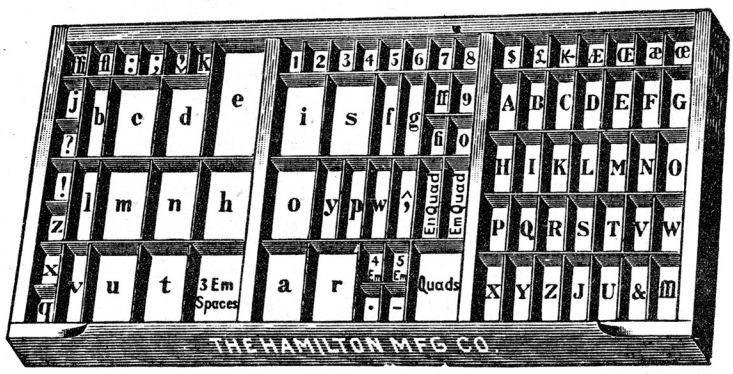


FIGURE 4

Improved layout for California job case.

will be observed that the : (colon) is placed in the box occupied by the 5-to-an-em space (in Figure 1), and the ; (semi-colon) takes the place of the 4-to-an-em space. The spaces are brought down over the period and the hyphen, adjoining the quad box, which is a more convenient location than in the old plan.

It is, of course, well known that the 4-to-an-em and the 5-to-an-em spaces are used much more frequently in almost all kinds of composition than the colon and the semi-colon. Bringing down these spaces places them in more accessible boxes than they occupy in the old plan and this facilitates both composition and distribution of type.

Before the invention of the type-setting and type-casting machines, the pair of upper and lower cases were in general use as the standard

cases for newspaper, book, and magazine composition and for large fonts of roman type, but these are now being rapidly abandoned for the more compact California job case. The double cases are, however, still used in composing rooms where much body type is set by hand.

New York Job Case

A single-case plan which is found useful in nearly all printshops doing general commercial composition is the style shown as the New York job case. It contains boxes for capitals, lower-case letters and small capitals. The lower-case boxes are reduced in size to permit the placing of two extra rows of boxes, two-thirds of the way across, which accom-

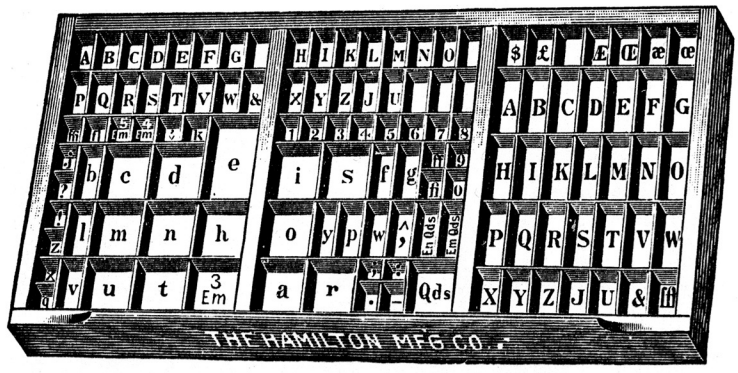


FIGURE 5
New York job case.

modate the font of small capitals, the section for the capitals being the same as in the California job case. The size of this style of case is usually the same as the California job case, 32¼ by 16⅝ inches.

Yankee Job Case

The Yankee job case has a cross-bar through the middle, the right half being divided into 46 compartments, and the left side into 40 compartments. The capitals occupy the two upper rows and run entirely across the case.

The Blank Case

The blank case may be had in full size or smaller; it usually has two compartments which are divided by a cross-bar. This case is frequently used for the storage of small engravings, or printers' cuts which are light in weight. Some blank cases are also made without the cross-bar.

Blank cases can also be conveniently used to fill the upper-case brackets of single or double stands, where job- or single-case fonts are em-

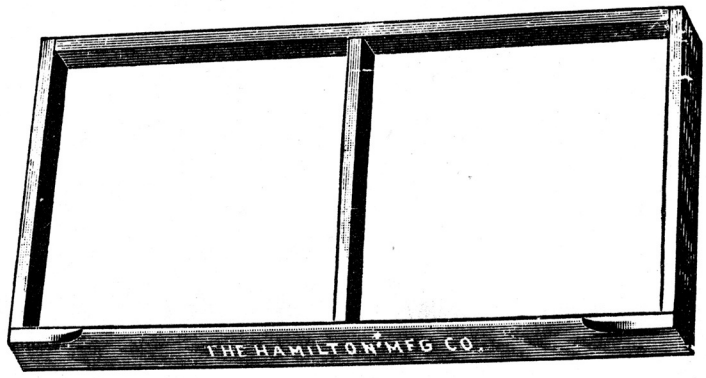


FIGURE 6
Blank case.

ployed on the lower brackets. The compositor's copy may be placed in the blank case lying above the single case, as this puts the copy within easy vision while being set.

Two-Thirds Case

The two-thirds case can be had in the California, Yankee or other job-case layouts. Its dimensions are 22¾ by 16⅝ inches. These cases

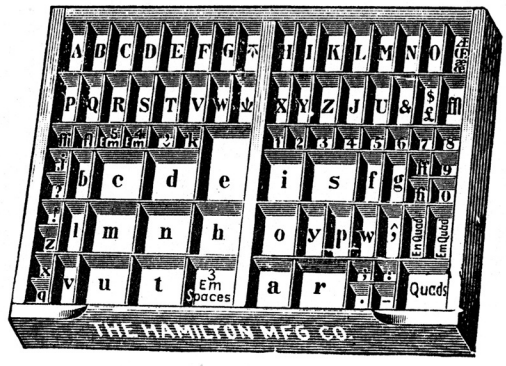


FIGURE 7
Two-thirds case, California job case.

require special cabinets, and are useful for holding small fonts or infrequently used type, ornaments or borders, and small stock cuts.

Quarter-Case

The quarter-case (15⅛ by 7⅜ inches) is most useful in tabular and other intricate work. Four quarter-cases may be placed in one blank

case, from which they are taken to the compositor's work-stand whenever the special characters, like oldstyle figures, astronomical signs, piece fractions, superior and inferior letters, or other arithmetical types, which are usually placed in these cases, are needed in composing jobs. Copper and brass thin spaces or justifiers are generally kept in quarter-cases. There are various layouts in quarter-cases. Some of these cases have 18 boxes, others have 20 or more boxes.

Triple Case

The triple case is a useful one for small fonts of special type. It will hold three fonts of caps, figures, and points. It has three main sections, each of which is divided into 49 boxes. Of these, the three top rows and the last row of boxes are smaller than the fourth, fifth, and sixth rows. The triple case is made in two sizes—full, and the three-quarters size—32¼ by 16⅝ and 26½ by 16⅝ inches.

Quadruple Case

The quadruple case has four sections of 49 boxes each, which can accommodate four small fonts of type, together with the figures and

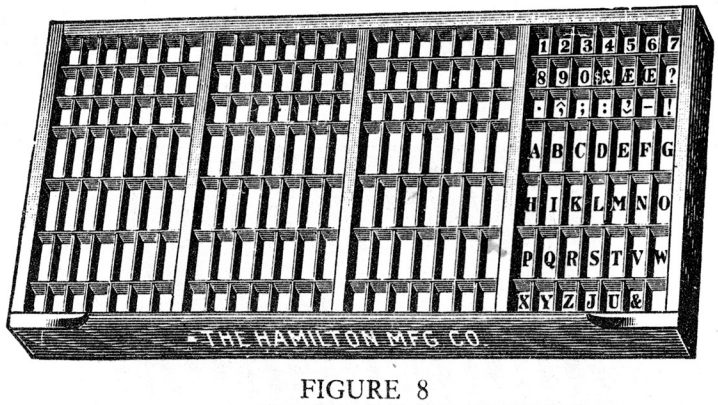


FIGURE 8
Quadruple case.

points. The boxes are half the size of those in the standard capital case. The quadruple case comes in full sizes only—32¼ by 16⅝ inches.

Lead and Slug Cases

Lead and slug cases are made in three sizes—full, two-thirds, and three-quarters. There are several styles which are still used to some extent. One style has cross-bars which fit into grooves at the upper and lower inside rim of the case. These bars can be adjusted by picas to

meet any requirement within the size of the case. Another style of case has a partition running the length of the case which has grooves on both sides. Short cross-bars can be inserted to run from the partition to the

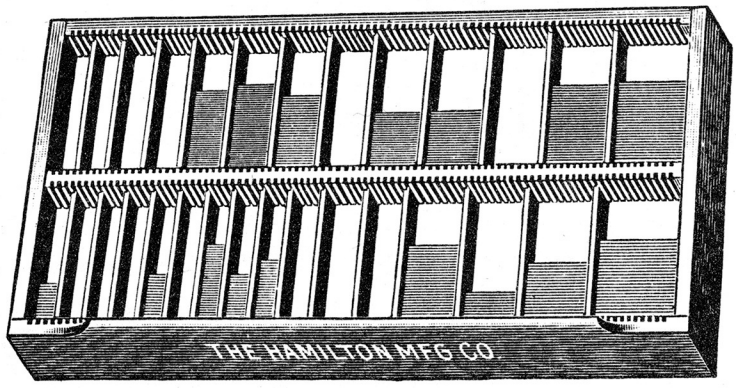


FIGURE 9
Adjustable lead and slug case.

lower and upper rim of the case. Both styles of lead and slug cases may be had in single or double depths—one or two inches.

Rule Cases

There are many styles and sizes of rule cases, but the quarter-size and full-size cases are the most popular. As the quarter-size case measures but 7⅜ by 15⅛ inches, four of them can be placed into one stand-

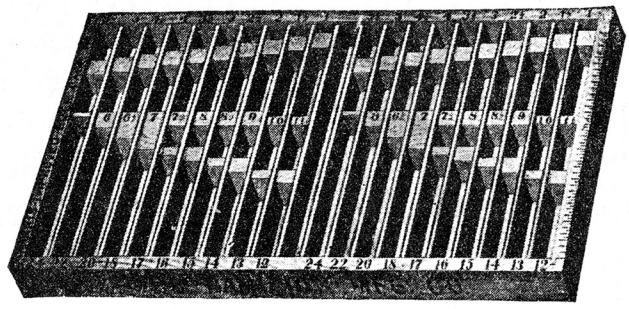


FIGURE 10
Harris rule case.

ard-size blank case, thus saving considerable space. Among the rule cases considered the most useful are the Harris, Perfection, Compact, and the Harms.

Harris Rule Case

The Harris case is made in two sizes—quarter, and one-half—and in several different styles. Style 1 holds two complete small fonts of

labor-saving rule, each weighing eight pounds, or sixteen pounds in all. Each half of this case holds eighteen pieces in lengths from 1 to 8½ picas (varying by ens), eighteen pieces each from 9 to 18 picas (varying by ems), and nine pieces each of 19, 20, 21, 22, 24, 26, and 28 picas, besides boxes for right and left miters.

Type Sifter or Transfer Case

A sifter case, as its name implies, is a case used for sifting dust and dirt from fonts of type. It is laid out after the plan of the California job case, but instead of having a solid bottom, has a fine wire screen. The

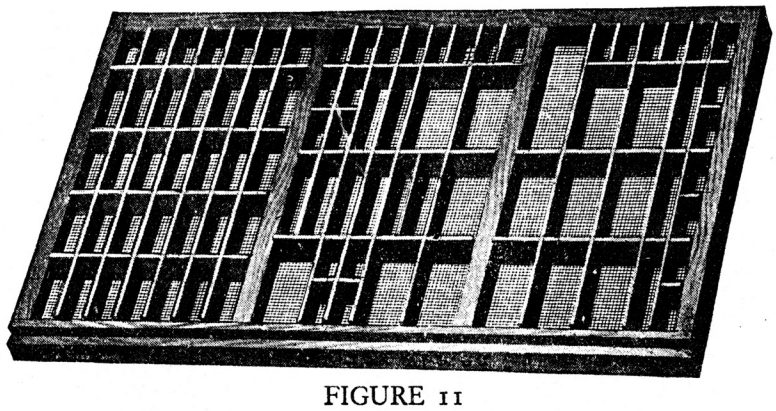


FIGURE 11

Sifter or transfer case.

sifter case can be attached to the top of the standard-size California job case, and then, by turning the two cases, the type is shifted from its own case into the case with the wire bottom. A mild shaking motion will remove all fine dust, grit, and other foreign matter from the type. After the process of cleaning has been completed, the type is turned back into its proper boxes in the original case, or it may be transferred to another case without injuring the face of the characters.

CHAPTER V

COMPOSITORS' TOOLS

In order to facilitate his work the compositor must have mechanical tools, and these have been devised and manufactured in great numbers. Probably the most important of all is the *composing stick,* in which the types are *set* or *composed.* Figuratively, at least, the types are also the compositors' tools, but in this book they will be treated under the more restricted headings of NAMES AND SIZES OF TYPE, and COMPOSITION.

THE COMPOSING STICK

If we delve into the history of the composing stick we find that the original composing stick was literally a stick of wood, with a side- and end-piece tacked on. For every change of measure a new stick or a re-tacking of the movable piece was required. The date of the introduction of the wooden stick is not known, but it was used, with but little alteration, for many years by printers of all countries. It is assumed that Gutenberg and other early printers did not have composing sticks, but that they set their types direct into mortised blocks of wood which served as chases, or into small wooden trays or galleys.

From the first tool the term "stick" has survived, though the material out of which it is made has changed. As the compositor's work grew in extent, more attention was given to the stick, and the first rude style was improved by adding a lining of brass or other metal to the wooden box to make it more accurate and more durable. Later, from a combination of wood and metal, it came to be made wholly out of iron or steel.

The composing stick is a low metal box with open front and top. It may be said to have four parts: the *plate* or *bed,* the *flange* or *back,* the *head* or *side,* and the *slide* or *knee.* As its name indicates, and as already stated, it was originally made of wood, and composing sticks used for setting large poster type in wide measure are still made of wood.

The common stick of today is made of polished stainless steel; sometimes it is nickel-plated to make it rust-proof. Composing sticks are also made of iron, brass, white metal, and vulcanite. The stick has a movable

knee to the left side, held in place by a thumb-screw, clamp, or other device, which enables the compositor to adjust it for setting any length of line within the limit of its size. For newspaper and other work, where the length of line is fixed, an adjustable knee is not needed, and so the stick is made in one piece.

The essential features of a good composing stick are that it may be set or made up quickly to the desired measure, that the knee is exactly parallel with the inside face at the right-hand end of the stick, and its structure is such that it will maintain an accurate measure until changed to another.

Different Styles of Sticks

There are many different styles of composing sticks in use today, and illustrations of some of the most practical ones are shown on these pages.

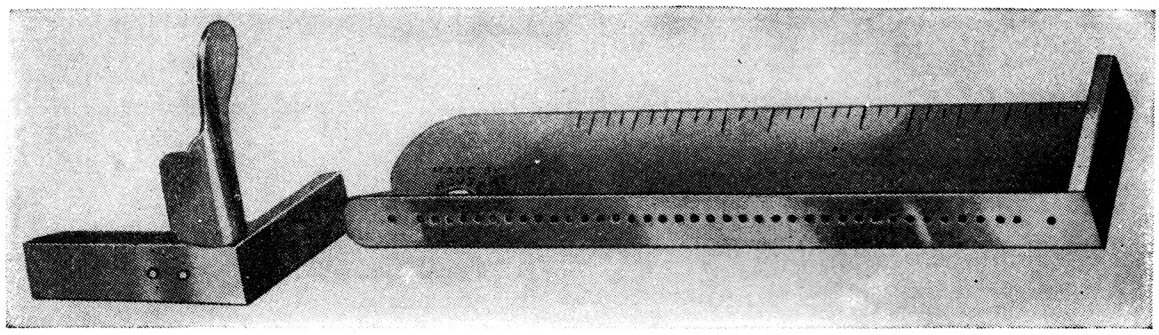


FIGURE 1

The Rouse "All-Measure" composing stick.

Nearly all sticks may be had in various sizes from 6 by 2 inches to 20 by 2¼ inches in length and width.

One of the best composing sticks for general job work is the Rouse "All-Measure" job stick, which sets to any odd-point measure and also locks to pica and half-pica measures. It is therefore a "break" and locking stick combined in one. In this stick two small pins in the knee are held in place by springs. Only one pin can engage in a hole at a time. One pin engages in a round hole in the back of the stick for pica measures, the half-pica pin being completely depressed. When the half-pica pin is engaged in a hole the full-pica pin is completely depressed. When the stick is to be set at any odd-point measure, both pins are completely depressed and not engaged in any hole. These sticks are made in 2-inch width only; lengths are 6, 8, 10, 12, 15, and 20 inches. They are manufactured of stainless steel as well as of ordinary steel.

The Rouse job stick may be had in various lengths, from 6 to 20 inches. Some sizes come in 1⅛-inch widths, others in 2- and 2¼-inch widths. The upper edge of the plate or bed is marked off in picas

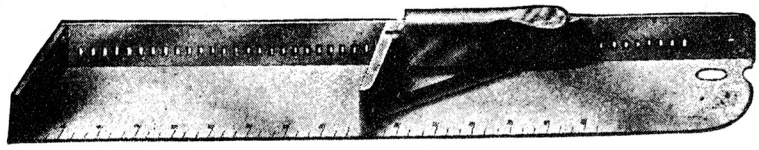


FIGURE 2
Rouse job composing stick.

and nonpareils (12 points and 6 points), beginning at the head and counting toward the side of the knee. The flange or back is pierced by a series of slots, extending the whole length of the stick. A segment of the slide or knee, containing several teeth, fits into these slots, and the two parts are held firmly together by a clamp, as in the old Grover or Standard sticks. The knee cannot be moved while the clamp is down and the teeth are in, but when it is raised the slide can be moved to any point or measure on the gage of the plate. A steel rack in the knee engages in rectangular holes in the back, spaced a full pica apart. To change from pica to nonpareil, a small lever, located under the clamp, must be turned one-half revolution, which moves the rack exactly six points. (See Figure 3, A, B, and C.)

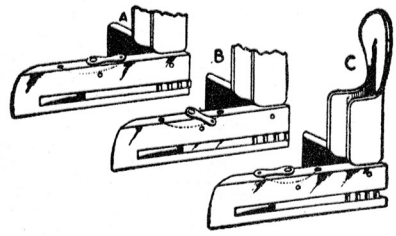


FIGURE 3
Detail-mechanism of Rouse stick.

The Yankee job stick is one of the older models of sticks, but many are still in use (Figure 4). This stick is not graduated to picas or half-picas, but it has a movable knee which is held in place by a steel clamp

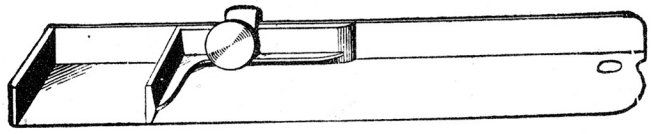


FIGURE 4
The Yankee job stick.

that clutches the back from the bottom and bends up over the top onto the knee-piece. The tightening is done by means of a thumb-screw. To set this stick it is necessary to use a gage of some kind—either several labor-saving brass rules, or 12- or 24-point quads, or letter m's of 12- or 24-point type laid into the stick sideways. About a half-point, or the

thickness of a thin piece of paper, should be inserted with the quads or gages, to allow for compression or "squeeze." Leads or slugs should not be used as gages in setting screw-clamp sticks to measure. Leads and slugs are frequently worn off at the ends, and are therefore not accurate.

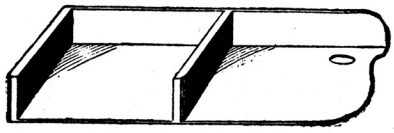


FIGURE 5
The Perfect news stick.

The Quarter-Point stick is a 1929 production, and is intended especially for work which requires odd measures. By moving the small lever (see Figure 6), the stick can be locked to points or quarter-points. Every notch on the segment represents a ¼-point movement of the knee.

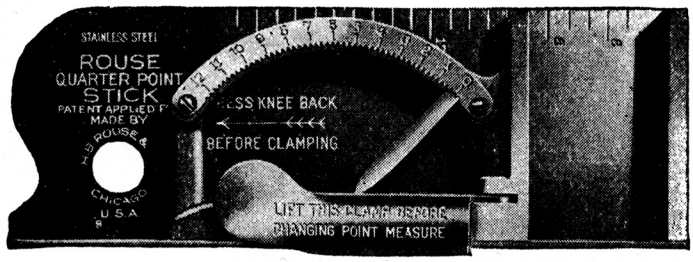


FIGURE 6
The Quarter-Point stick.

The Composing Rule, and the Make-up Rule

Composing rules are made of polished steel or brass, about the same height as type (0.918 inch), and range in length from 12 to 36 picas. The composing rule usually has a projection or nib at one or both sides, so that it may be easily lifted up and out of the composing stick when the lines that are set against it by the compositor are completed. The bottom edge is slightly sharpened. The smooth sides of the rule and its height, which exceeds that of the composing stick, facilitate the setting of solid lines of type, making it easy to move the letters back and forth while the line is being justified. But when type lines are to have leads between them, the value of the composing rule is doubtful, and very little time can be saved by using it.

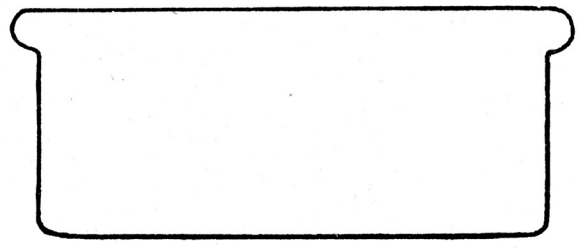


FIGURE 7
The composing rule.

because the leads which are needed for producing space between lines can be used instead of the composing rule. In many shops doing general composition the composing rule is now rarely seen. Its chief use today is for pushing down the end of the cord while tying up a job. On newspapers and magazines where many lines of body type or display headings of the same width are set by hand, the composing rule still has a useful place among the compositor's tools.

The make-up rule, as its name implies, is used for making up columns or pages and finds its greatest usefulness among newspaper or magazine compositors. It is a flat piece of smooth steel, exactly the

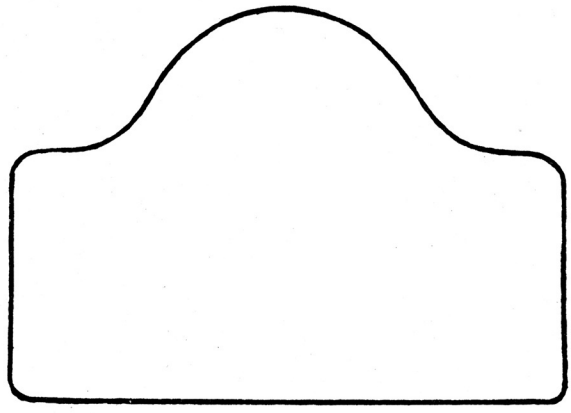


FIGURE 8
A make-up rule.

length in picas or half-picas of a column-width of the page that is to be made up. It has a hump on the upper edge which projects above the top of the type when placed between lines. Its lower edge, like that of the composing rule, is sharpened like the blade of a dull knife. The hump on the rule and the sharp lower edge enable the compositor or make-up man to push it down between type lines or leads, thereby easily separating them, and moving the lines up and down on the galley or imposing stone. The make-up rule can be used to advantage to straighten lines of type that are off their feet while these are still on the galley. The make-up rule, comparatively speaking, is more useful than the composing rule to the average compositor, but it cannot well be used for setting type, because of the hump.

The Printer's Galley

Next to the composing stick, the *galley*—probably so called because the galleys of the early printers were shallow, oblong troughs and

suggested the shape of a nautical galley or barge—is the most essential accessory of the printshop. (The German name for galley is *Schiff*, meaning ship.) The modern galley is a shallow tray, made of metal or

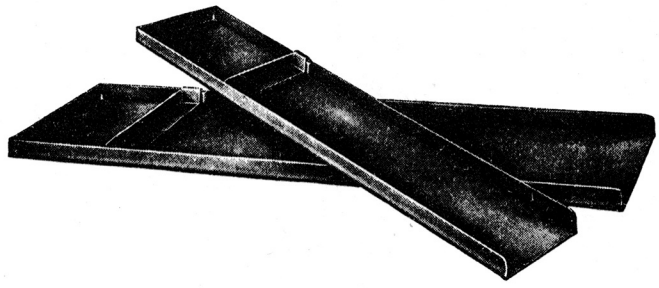


FIGURE 9
A single and a double-column news galley.

wood, used by the compositor to hold the type after it is set in the composing stick. Nearly all galleys today are made of metal—brass, steel, or cadmium-coated steel. Cadmium-treated and brass galleys are rustproof. Formerly, like the composing stick, they were made of wood, and later they were lined with zinc or brass. In material, shape, and size the galley consists of a smooth piece of metal, about 1/20 (.050) inch thick, with three perpendicular sides or flanges about ⅝ inch in height. The lower end of the galley is left open to permit the pushing off of the type onto the imposing stone. The dimensions of the usual single-column

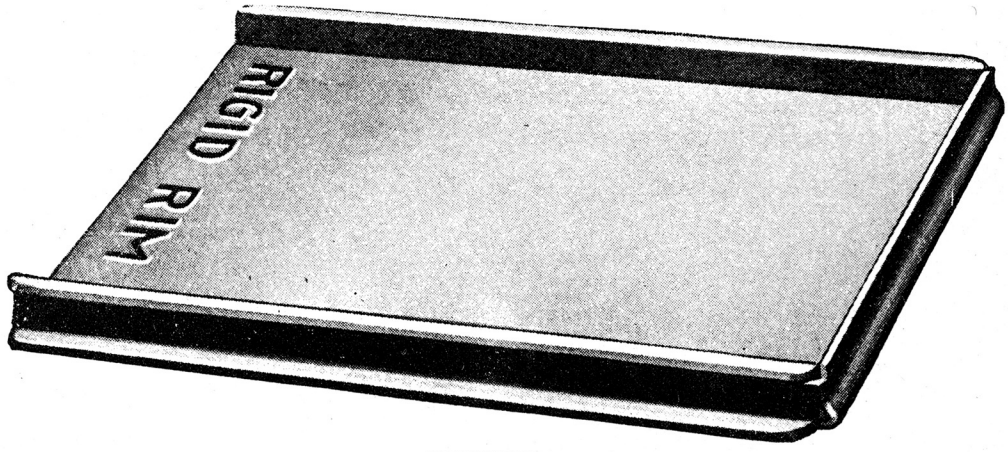


FIGURE 10
A standard job galley.

news galley is 2¾ by 23½ inches, but almost any other size or shape may be had, ranging from 6 by 10 inches up to 23½ by 26½ inches. Some of the large-size galleys are marked with a scale of 12-point ems and half-ems on the upper rim and on the left-side rim. The 6 by

10-inch galley is conveniently used as a distributing galley, as it can be easily carried about in one hand, from case to case. The standard storage galley measures 8¾ by 13 inches.

The open-side galley has the top and bottom ends and the left-hand side closed. This prevents any possibility of disturbing its contents when inserting or withdrawing the galley from the cabinet. These galleys are made in four styles, each galley having one, two, three, or four compartments. They are very convenient for making up or correcting, as the empty compartments can be utilized for momentarily storing lines or portions of the page which is being made up or corrected.

Some galleys are made in one piece from pressed steel; others have riveted flanges or sides. Still others, the so-called make-up galleys, have stationary or movable lock-up devices, either at the bottom, or both at the bottom and at one side. Many job galleys have a pica scale on the top rim and on the left-hand side rim.

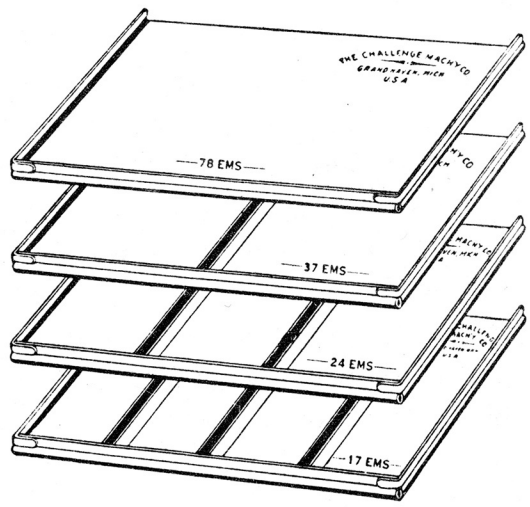


FIGURE 11

The open-side galley, shown in four different styles.

Type which is set on slug-casting machines, like the Linotype, Intertype, Linograph, Ludlow Typograph, does not require locking up from the side when taking proofs.

Lye or water should not be put on galleys that are made of steel or other metal; strong lye should not come in contact with zinc or brass galleys. Every printshop should have a few wooden galleys, on which type that is to be washed with lye can be placed.

Cadmium-plated galleys are probably the most useful and durable, although they cost slightly more than other kinds. They are rust-proof. All metal galleys, and especially those made of steel, should occasionally be wiped off with machine or lubricating oil.

Leads and Slugs

Leads, as the name suggests, are strips of lead-metal of various thicknesses, cut to any desired length. Strip leads are usually 144 picas long

and ¾ inch wide or high. In thickness they measure from one to four points. When they are thicker than four points they are called *slugs*. (In England slugs are called *clumps*.) The one- and two-point leads and the six-point slugs are the most common thicknesses. In labor-saving fonts, leads and slugs are sold in graduated lengths. From one to ten picas they are graduated by six points; from ten picas upward they are graduated by ems, and in large fonts they run up as high as 50 picas in length. Thin leads easily become bent, or irregular in thickness, when not carefully handled. Leads are made of softer metal than type, and are sometimes made of brass for use in newspaper printshops, where one-, two-, three-, and four-point leads are used. The advantage of brass leads over the other kind is that they can be used indefinitely without bending or becoming bruised.

Because leads and slugs are ¾ inch high, which is equivalent to about 4½ picas, care must be used not to turn the 4½-pica pieces around the wrong way, and then put them into the 4-pica compartment in the lead-rack.

The purpose of leads and slugs is two-fold: They produce the white space between the lines of type, because they are lower than type, and they facilitate the setting, spacing, and correcting of type, in addition to holding the lines together when type is set in large masses.

Leads and slugs are sold by the pound, the thinner the leads, the higher the price per pound.

Sixtus Reissinger of Naples, in 1485, is said to have been the first printer to use leads between his lines. Gutenberg used thin strips of paper between the lines of some of the pages of the *42-Line Bible*.

Weight of Leads in a Page of Type

In order to compute the weight of the leads in a booklet of 4, 8, 12, 16 or more pages we must either weigh the leads in a single page, or we must weigh some strip leads, unless we have some basic figure for reckoning. Leads may be bought in labor-saving lengths or in strips 144 picas long. A 10-pound package of 2-point leads contains 54 strips, each 144 picas long. Ten pounds of 6-point slugs of the same length contain one-third as many strips, or 18 pieces. Ten pounds of 12-point slugs contain 9 strips. Ten pounds of 1-point leads will contain 108 pieces 144 picas long.

If we multiply the width, in picas, of a type page by two more than the number of lines of type, the result will be the running length of the

leads to the page. (In pages that are to be leaded, allowance should be made for at least one lead at the top and one at the bottom of the page; two or three leads or a 6-point slug at the top and at the bottom would be even better.) By dividing the running length of the leads by 144 picas we can easily determine how many strips will be required for one or more pages of type.

Example: Find the number of 2-point strip leads (and their weight) that would be required for a page set in 12-point type if the page is 24 picas (4 inches) wide, and there are 40 lines to the page.

Solution: 42 leads (two more than the number of lines of type) 24 picas wide or long equal 1008 picas (running length of the leads to the page): 1008 divided by 144 equals seven strips; inasmuch as 54 strips weigh 10 pounds, one strip weighs 0.185 plus; therefore, seven strips must weigh 7 × 0.185 plus or 1.295 pounds.

Example: Determine the number of leads required for a job set in 10-point type. The dimensions are 18 picas wide, and there are 31 lines to the job, which is to be leaded with 1-point leads.

Solution: 18 picas equals 3 inches (the width of the job); with 31 lines of 10-point type (the depth of the job), 31 plus 2 gives 33 (the number of leads in the page); 33 × 3 inches = 99 inches, or 594 picas (the running length of the leads in the job); 594 picas divided by 144 gives 4.125 strips of 1-point leads. There are 108 strips in 10 pounds, so that in one pound there would be 10.8 strips. The 4.125 strips would therefore weigh less than one-half pound.

High Leads, Slugs, and Quads

High leads and slugs are 0.860 inch high. This is slightly higher than the ordinary leads and slugs, which are 0.750 inch high. High leads and slugs are intended for use in forms from which *electrotype* plates are to be made. They may be had in labor-saving lengths or in long strips.

High quads and spaces are of the same height as the leads and slugs, and are used in composition of type which is intended solely for electrotype plates. High spacing material in electrotype forms prevents deep crevices, and therefore facilitates the making of the electrotype mold and plate because the wax, when flowed over the form in making the mold, will not run far beyond the type surface, and will be confined almost entirely within the limits of the printing surface. This produces a mold which can be easily removed from the type and requires very little building up. It is, however, practical to make electrotypes from type forms in

which ordinary spacing material is used, and today a great many electrotypes are made that way. Of course, making molds from forms spaced with ordinary leads, slugs, quads and spaces requires more time than would be necessary for those forms which are spaced and leaded with high material.

Brass and Steel Rules

Brass rules are used for many kinds of composition where straight (horizontal or vertical), wavy, dotted, or dash lines are required. They are used in tabular matter, and in display composition for underscoring type lines, for borders, boxes, and panels. Brass rules are type-high and usually vary in body thickness from 1 to 12 points, and their printing surface may be a fine hairline, a fractional part of a point in width, or more, as necessary. The specimen book of the American Type Founders Company shows several pages of different kinds of brass rules, which are cast as single, double, triple, or quadruple lines.

Instruction: In setting jobs with rules it is important to select a rule the face of which will harmonize with the design and heft of the type-face. Pleasing harmony may be obtained when the line produced by the rule is no heavier than the lightest element or stroke in an individual letter. In other words, a small, light type-face will require the use of a fine or light rule, whereas a large and bold-face type will require a heavy or black rule to give it harmony.

When the printing surface on brass rules is placed at one side it is called a *chamfered, beveled,* or side-face rule, but such rules are seldom over 6 points in body-width. The advantage of the chamfered rule over other styles is that it may be made up into boxes or panels without first *mitering* the ends.

When rules that have a surface wider than one point are used for making panels they should be mitered in order to make them join perfectly at the corners. The ends are usually mitered at an angle of 45 degrees.

Brass rules may be had in strips up to 2 feet long or in labor-saving fonts containing an assortment of lengths, put up in a special rule case. The number of pieces of each length varies with the size of the font. The lengths are cut to picas and nonpareils (1, 1½, 2, 2½, 3, etc. up to 10 picas), then by ems (11, 12, 13, 14, etc.) up to 50 picas. The number of picas, indicating the length of the rule, is stamped with a punch on the rule's side.

Hairline

One-half point

One point

Wavy

Dotted

Hyphen

Ornamental wave

Irregular wave

Perforating

Scoring

Ends mitered—Forty-five-degree angle

Ornamental (metal) borders

FIGURE 12

Showing different styles of brass or metal rules.

Many compositors when looking at brass rules have difficulty in distinguishing between a rule having a printing surface of a hairline, 3/5 of a point, a half point, or one point, even when the rule cases containing these are plainly marked. A good plan is to have a letter, in addition to the em number, stamped on the side of the rule.

Use A on the hairline rule, B on the next heavier, then C, D, etc. The rule-case labels should, of course, also be marked accordingly. This plan has been found useful in avoiding mistakes when setting rule jobs.

Ornamental brass rules may be had in many different designs. They can be used for borders or other purposes in display composition. A few specimens are shown in Figure 12.

Machine-cast Rules

Practically all the different designs obtainable in brass rules may also be had in lead rules, which are cast in strips on the Monotype, Linotype, Ludlow, or some other machine. Lead rules are less expensive than brass rules, but they are also less durable.

Perforating Rules

Perforating rules are made of brass or steel, slightly higher than type, and have sharp serrated or toothed edges. This style of rule is used in the printing of coupons, checks, tickets and other jobs which require to be partially severed or perforated while going through the press. Perforating rule usually has a 2-point body, the face of which is sharpened to about one-half point. When the rule is pressed against the sheet of paper it punches through. Both perforating and printing may be done at one operation, provided that the press has been properly prepared for the work.

Scoring or Creasing Rules

Scoring rules do not differ materially from other brass rules used for printing purposes. Scoring or creasing is necessary on some cardboard and paper, so that they can be folded exactly at certain points; such scoring is always essential when the fold must be made at right angles to the grain of the paper. The best rules for scoring purposes are newspaper column rules, having a 3-, 4-, 5-, or 6-point body and a 1-, 2-, or 3-point face, although for some jobs a wider-faced rule may be desirable. The so-called round-face scoring rule, having a 2-, 4-, or 6-point face, is frequently used for the scoring of cover stock. Scoring is done while the

sheet is being printed or afterward, depending on the nature of the job, by locking up the rule in the required position in the chase. This does, however, require special make-ready on the platen or the cylinder of the press.

Cutting Rules

Cutting rules are slightly higher than 0.918 inch, and are made of blued or polished steel, with the cutting face in the center or on the side of a 2-, 3-, 4-, or 6-point body. These rules are usually sold in strips by the foot, and can be had in soft or hard steel. They are used in making up dies or forms for cutting cardboard cartons. Such forms and dies require special presses or special preparation on ordinary presses before they can be used effectively.

In some shops cutting rules which are several points less than type-high are used in type forms. Such low rules will not injure the press rollers; but in order to make them cut the paper, the packing on the cylinder or platen of the press must be built up several points to meet the steel cutting rules.

Line-Gage and Page-Gage

The printer uses the *point system* as well as the linear system of measurement for determining the length, depth, or width of his type lines or masses. His measuring rule must therefore be graduated first of

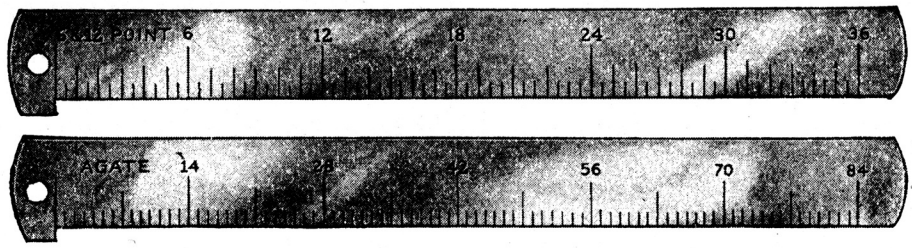


FIGURE 13

A nonpareil and pica, and an agate line-gage.

all in ems and fractional parts of an em. Some *line-gages* are marked off in inches and sixteenths of an inch at the top, pica ems and half-ems at the bottom on one side, and 10-point ems and 8-point ems on the reverse side; others contain only pica and nonpareil marks; yet others, for use on newspapers, have 12, 10, 6, and 5½-point graduations. Line-gages are made of wood, steel, brass, and aluminum, and range in length from 7 to 15 inches.

The *page-gage* is a measure by which the lengths of pages or books or other publications are gaged in order that all pages may be of the same length. A page-gage may be made of a piece of *reglet* or of brass or steel rule. When many pages must be made up exactly the same length, a gage of this style will be found convenient, as it facilitates the work of the make-up man. The gage should cover at least the entire length of the page, and where the page ends a notch or groove should be cut or filed, as shown in Figure 2, Chapter XVII. In book composition, where allowance must be made for *chapter headings, running-heads,* etc., the placing of these may be indicated on the gage by some mark. The type should always be compressed as much as possible when the gage is placed alongside of it on the galley, in order that there may be only a slight difference in length after the page is locked up.

Corner-Quads, Angular Quads, and Circular Quads

Corner-quads are used when making up panels and boxes of brass rules in order to secure a perfectly fitting junction of the corners by preventing them from slipping past each other. These quads are made of brass or lead-metal, on 2-, 3-, and 4-point bodies in brass; and on 6- and 12-point bodies in brass and in lead-metal.

Angular quads are used in composition that requires the setting of rules and lines at an angle, as in some jobs of tabular work, label, and map work. They are cast on 12-, 18-, 24-, 36-, 48-, 60-, and 72-point bodies.

Circular quads are essential for job work when a circular rim or border is required around the type lines and where curved lines are needed. The steps on both sides are graduated in ems, and this allows one quad to interlock the other. They are made in assorted sizes, from 6 to 24 picas in length.

All three styles of quads are of ordinary space and quad height, and are sold in sets of four.

Labor-Saving Furniture

All materials used in the printshop today are labor-saving, which means that they are graduated in size according to the point system and can be interchangeably used with the other different kinds of material in the composing and press rooms. *Furniture* is a term applied to pieces of wood, lead, iron, steel, or metallic alloys. The purpose of furniture is to fill in the empty spaces in type jobs, between pages, and around the type-forms when locked in a chase. Furniture is made in many lengths

and widths, but the sizes are always multiples of pica ems. The thinnest pieces of wood furniture are 18 points wide, and the largest pieces are 3 feet long and 10 picas wide. The largest dimension for metal furniture is 80 by 12 picas and 2 by 10 picas is the smallest. In using furniture, the largest possible units or combinations available should be employed.

Metal furniture is kept in special cases or in racks. Wood furniture is now rarely kept in cases. A standard-size case can accommodate but a small font of furniture, and this easily becomes jumbled up in the case. The furniture rack or cabinet is by far the most practicable container for this material. This cabinet has open compartments of all lengths and thicknesses, and these compartments are easily accessible.

Wood Furniture

Wood furniture is made of well-seasoned cherry or other hard wood, and is saturated with an oily solution which protects it to some extent from the influence of moisture. It should not, however, be allowed to get wet. The lengths of wood furniture are usually 10, 15, 20, 25, 30, 40, 50, and 60 picas, which fit into the ordinary furniture cabinet. The length of each piece is stamped on one of its ends. The widths of this furniture are 2, 3, 4, 5, 6, 8, and 10 picas. It is about ⅝ inch high, which is slightly lower than metal furniture.

Wood furniture is used primarily for lock-up purposes, and to fill narrow blank spaces on the outside of pages in large forms of type or plates. It is a serviceable lock-up appliance when in good condition, but it will not withstand the pressure of the *quoins* for any considerable length of time without becoming inaccurate in dimensions. Exposure to excessively damp or dry air will produce a slight variation in its size, causing it to either expand or contract.

Metal Furniture

All *metal furniture* is cast in pieces which are multiples of pica ems, and is 11/16 inch in height. A 25-pound font contains enough pieces to cover about 250 square inches in 2, 3, 4, 5, 6, 8, 10-pica widths, and 4, 6, 8, 10, 15, 20, 25, 30, 40, and 50-pica lengths.

Metal furniture may be divided into two groups. The first group is used in combination with type to fill blank spaces in jobs of small or medium size, as rule forms, boxes, title pages, etc. The second group is used primarily for producing margins between type pages in imposition and lock-up, and for blank pages in forms.

In the first group the *lead furniture* is the cheapest, but it is not satisfactory because it will not remain true to its original dimensions. Lead, being a soft metal, will easily become dented or bruised. Lead furniture, however, does possess the advantage over iron furniture that it will not rust when exposed to moisture.

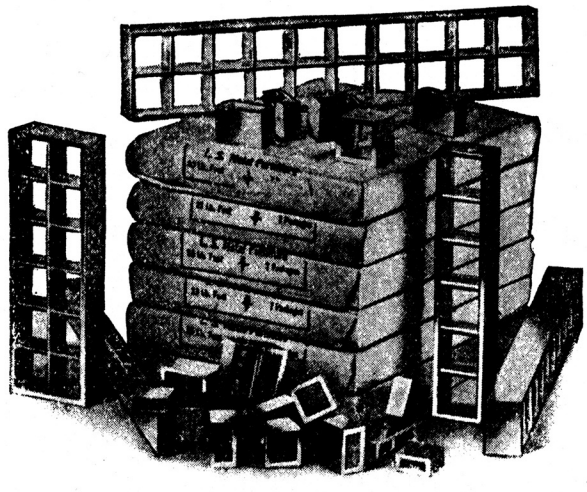


FIGURE 14

A group of labor-saving metal furniture and quotation quads.

Quotation Furniture or Quads

Quotation furniture (also called quotation quads or quotations) is made of lead or type metal, mostly in small-point sizes, as follows: 18 by 36, 24 by 24, 24 by 36, 24 by 48, 36 by 48, 36 by 72, 48 by 48, 48 by 96 points. In quotation furniture the lower or bottom side is hollow, but the top is like a solid quad. In setting this style of furniture, the hollow part should be placed downward. This prevents dirt, paper-fuzz, ink, etc., from accumulating in the cups which would be formed if the hollow parts were placed upward. When this furniture is improperly placed these hollows sometimes create a suction, if the form is printed on a fast press, thus interfering with good register.

Furniture made of hard metal is preferable to lead because it is more durable and remains accurate in dimensions in spite of continuous usage. It is, of course, more expensive than lead.

Railroad or Reversible Furniture

In the second group we may place the *railroad* or *reversible furniture* (so called because it resembles a miniature railroad tie), and the large

sizes of iron, steel, or other metallic furniture. Railroad furniture is made in 16½-inch lengths on 2, 3, 4, 5, 6, 8, 9, and 10-pica bodies, and being soft metal, may be cut to any desired length. This kind of furniture is concave on the top and bottom, but has a solid bed in the center. It is serviceable for *gutter-margins* and other places where lock-up pressure is needed only on two opposite sides. It is, however, rapidly being superseded by the more accurate iron furniture.

Challenge Iron Furniture

Challenge Iron furniture is made from fine-grained castings, perfectly smooth and ground to point-system accuracy. Each piece has its

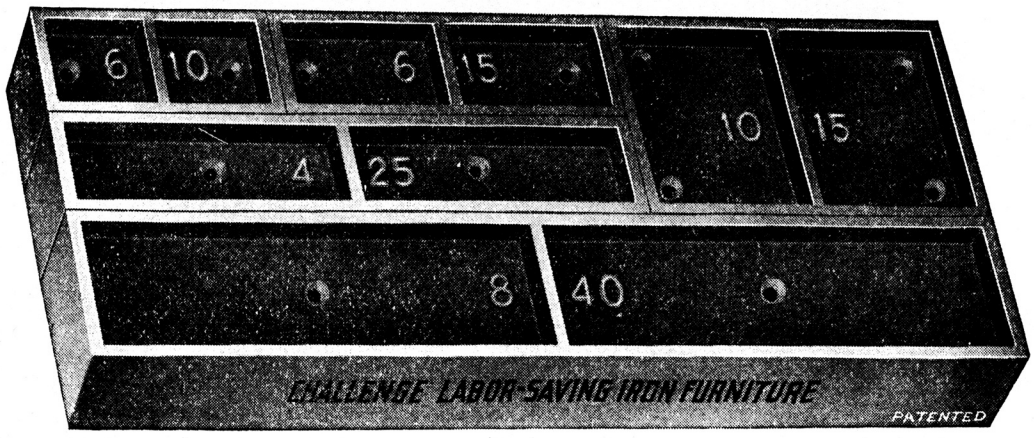


FIGURE 15

Five pieces of metal furniture, placed together, forming a rectangle, 40 by 18 picas. (In actual practice only two pieces would be used.)

size indicated by raised figures on both sides, and holes at the four corners allow for proper drainage. A cross-bar in the center on both sides of each piece provides a finger-hold for lifting it from the form or case. A small font contains 392 pieces, which will cover 800 square inches.

Interlocking Steel Furniture

This kind of furniture is conveniently used for filling large blank spaces. Each piece has from one to three steps or notches on each end. By interlocking four pieces, thus forming a frame, material and time may be saved. For instance—if we have a blank space of 48 by 60 picas to fill (80 square inches), we use four pieces of 36-point stock, which is a saving of 63 square inches of ordinary furniture, and necessitates the handling of but four pieces of material. Interlocking furniture may be

had in various lengths and thicknesses, multiples of picas, from 42 picas up to 24 inches in length, and from 24 points up to 54 points in width.

Mammoth Iron Furniture

Mammoth Iron furniture is made in 65 sizes, from 15 by 20 picas up to 60 by 120 picas in dimension. Each piece has its dimensions stamped on both sides of its bed, which is made with two or more circular or

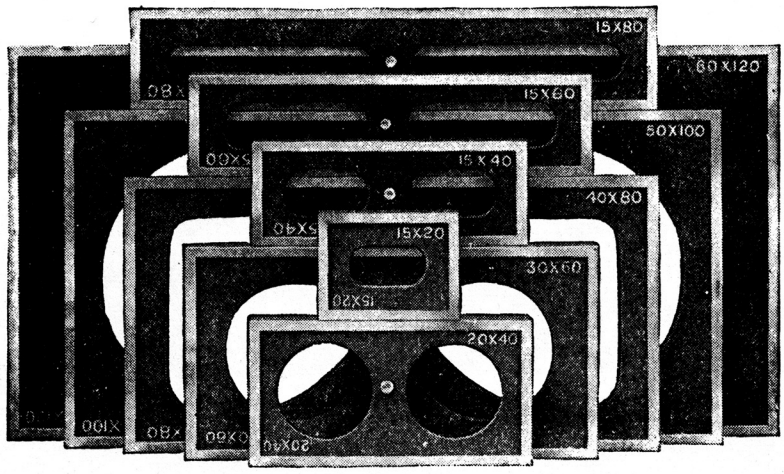


FIGURE 16
Mammoth Iron furniture

oval holes. This style of furniture is used for large, open forms, such as loose-leaf and blank-book work, blank pages in forms, blanking out color and folding box forms, and for locking small forms on the bed of a cylinder press.

All iron and steel furniture should be kept free from moisture and should be wiped off with lubricating oil or kerosene from time to time.

Aluminum Alloy Furniture

This kind of furniture is made in all the standard-size pieces. It weighs about two-thirds less than iron or steel furniture; it will not rust or corrode, and is made as accurately as humanly possible. Lye or other strong cleaning solutions are injurious to aluminum metals, and should not be used in cleaning this kind of furniture.

Reglets

Reglets are thin strips of hard, flexible wood, which has been kiln-dried and accurately cut to point-system thicknesses of 6, 12, and 18

points. Before the wood is cut into yard-lengths it is treated with an oily solution which helps it resist moisture. It is then put up into bundles of 25, 50, 100 or more strips. The reglet is used in the composing room instead of leads or slugs in the setting of posters or other large jobs where slugs and furniture would be cumbersome. The most common thicknesses are 6 points and 12 points. Reglets are also used by the stoneman on each side of the quoins whenever possible to protect the furniture in locking up forms.

Proof Planers

There are two or three distinct kinds of *planers* among the compositors' tools. The *proof planer* is made of selected rock maple or other hard wood, 8 inches long by 3¼ inches wide and 2½ inches high. The face of this block of wood is covered with a closely woven, firm and durable felt, or thick cloth. The top or back of the proof planer is usually protected with a heavy piece of leather or rawhide.

Form Planers and Mallets

The *form planer* is made in two sizes—3¼ by 6 inches, and 3¼ by 8 inches; both sizes are about 2½ inches high. As the form planer is used for leveling type forms, its face must be perfectly level and smooth.

The *mallet* is a tool that is used in conjunction with the planer, either for beating *planer proofs* or for planing down forms. Several styles are in popular use in printshops. The wooden mallets are made of hickory or lignum vitæ, the latter being heavier, bulk for bulk, than those made of hickory wood. Some mallets are bound with rawhide. The mallets which have their ends covered with rawhide are better and more expensive than the plain wooden ones, as the rawhide prevents the ends from splitting or splintering after continuous usage. Still other mallets are made entirely of hide. These have heads made throughout of rolled raw-

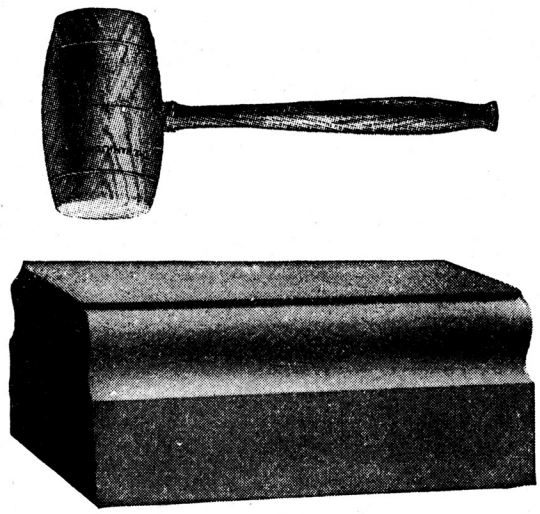


FIGURE 17
A form planer and mallet.

hide, especially treated, and formed into their shape by means of hydraulic pressure and kept in shape by waterproof adhesives. The handle is of wood, and is firmly fastened into the head. The sizes of mallets range from 1½ by 2½ inches (size of head), weighing five ounces, up to 3½ by 6 inches, weighing 2¼ pounds.

Lead, Slug, and Rule Cutters

Lead, slug, and rule cutters are small hand-lever machines which belong to the essential equipment of the composing room. These machines should not be used without the permission of the foreman or the person in charge of the composing room. All leads, slugs, and brass rules are usually kept in labor-saving lengths, and do not require cutting. In shops where leads, slugs, and rules are cast in strips on Monotype, Linotype, or other machines, there is frequent use for a lead-cutter in order to get material of a desired length which may not be in the labor-saving assortment. In a school or shop where there are no machines casting leads and rules, and where the regular foundry leads, slugs, and rules are used, the apprentice should be careful not to cut any material which is not in long strips. It is exceedingly wasteful and it causes untold trouble and annoyance when labor-saving brass rules (which have their pica lengths stamped on their sides) are cut down to shorter lengths, because they then cease to be labor-saving and merely create confusion. No attempt should be made to cut leads, slugs, or rules without permission, and without a knowledge of the mechanism of the cutting machine.

Rouse Lead and Slug Cutters

The Rouse American lead and slug cutters are so-called combination cutters, having a double bed-plate, the one side (front) of which is used for cutting leads, and the other (back) for slugs and rules. The knife, which is securely fastened in the cutting-lever, has two different edges. The front part of the knife (for leads) has an edge which is ground exactly parallel to the under cutting edge, so that the lead is chopped off with a uniform pressure across the width or the strip. The back part of the knife, for slugs and brass rules, has its upper edge ground at a slight angle, and the cutting is done by means of a shear-like motion; of course the back part of the knife-lever, because it is near the post, gives the greater power necessary to shear off the tougher and thicker metals.

In the Rouse "Forty" cutter, the long bed will take a lead or slug 106

picas in length. The gage locks automatically, and is graduated to cut up to 106 picas by half-picas, and up to 45 picas by points.

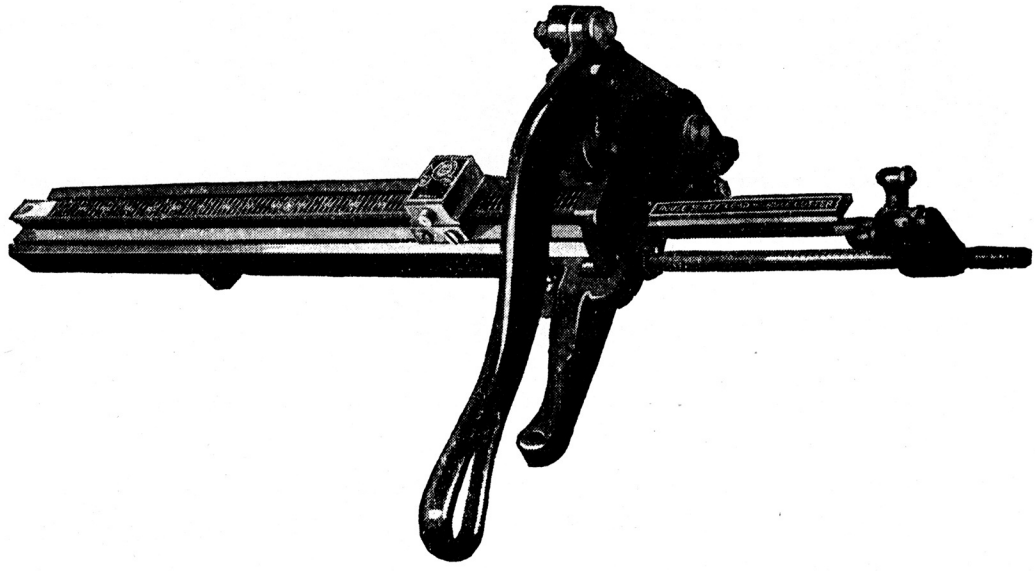


FIGURE 18
The Rouse "Forty" lead and rule cutter.

Mitering Machines

In the modern printshop the *mitering machine* has a definite and useful place when it is used with care. To employ it effectively requires a little more skill than is necessary to manipulate a lead-cutter. The beginner at composition has no occasion to use a mitering machine; it really belongs to the tools of the experienced compositor who has to make up panels and boxes with 2-point, double, or parallel brass or metal rules and borders. Although perfect joints at the corners can be secured with a fine line face that covers the body of the rule, where the face is flush to one side, the wide-faced rules, single, double, or parallel, cannot be perfectly joined unless they are mitered or trimmed off at a bevel, usually on an angle of 45 degrees. Most of the labor-saving brass rules of from 3- to 6-point thickness that are to be used for boxes or panels are correctly mitered before they are sent from the supply house. In shops where machine-cast rules are in use, these may easily be mitered to produce boxes, panels or borders. In mitering brass rules, a burr may appear on the lower end of the rule, making it more than type-high at that end. This burr must be rubbed off with fine emery cloth or a fine file before the rule can be printed.

Instruction: Make up a composing stick, with quads or 6-point slugs on each end, to the required width, as shown in Figure 19. The slugs protect the

mitered edge of the rules. Cut the rules a few points longer than required to allow for any miscalculation; next miter first one end and then the other.

FIGURE 19

Showing a good method of mitering rules to an exact length.

The rules must be exactly the same length. After the first two rules have been mitered, break the composing stick, set it to the required measure, and proceed to cut and miter the second two rules in the same manner as the first.

Three-fifths to ¾-point face rules which have the printing surface at one side on a 2-point body, or any rule with fine printing lines, can be made into boxes or panels without mitering the ends. This is done by

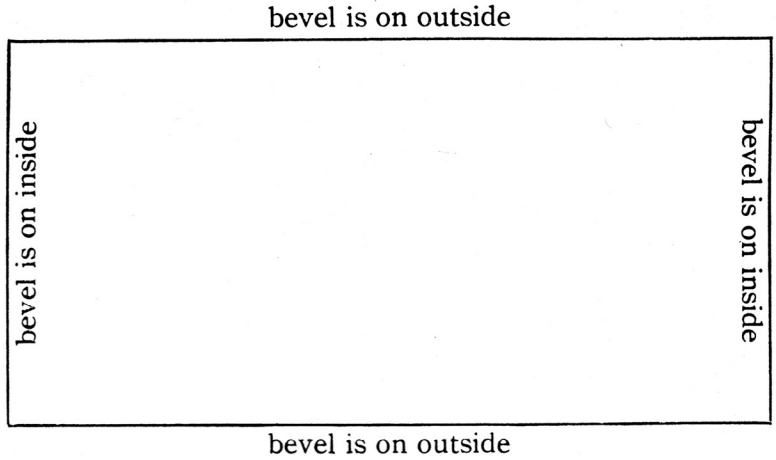


FIGURE 20

Showing how a panel is made without mitering the rules. The body of the four lines of type touches the rules.

turning two rules with the bevel at one side, and the other two with the bevel at the opposite side, as shown in Figure 20. Beveled rules are also called *chamfered* rules. Care must be taken that both edges are beveled alike, although in opposite directions.

Rouse Mitering Machine

This machine has an accurate gage that sets and locks automatically to points, thus enabling one to miter all rules to even and half-picas,

inside measure. The gage-rod, on which the gage-head slides, is graduated to picas and has flaring notches 6 points apart on one side. These

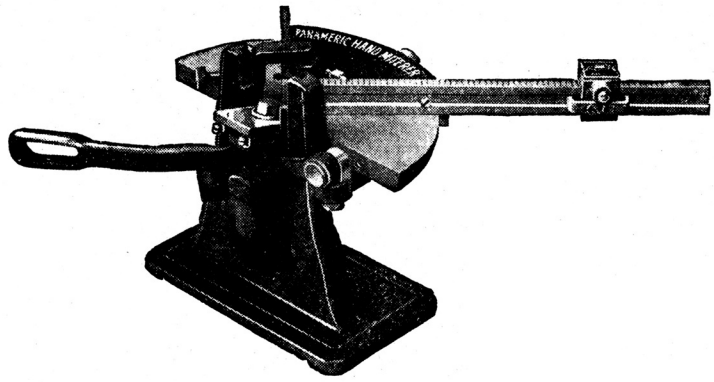


FIGURE 21
The Panameric hand miterer.

notches are engaged by four teeth of the same taper on the end of a bolt, which is held firmly in mesh by a stiff spring. The point adjustment is obtained by turning an index nut, which has six equally spaced notches in its outer surface. One revolution of the nut to the left moves the entire gage exactly 6 points away from the knife, thus adding 6 points to the measure indicated by the graduations on the rod. Consequently, one-sixth of a revolution (one notch) adds 1 point, two notches add 2 points, etc. The knife-holder travels in two vertical slots milled in the body of the machine. These slots are somewhat wider than the guides on

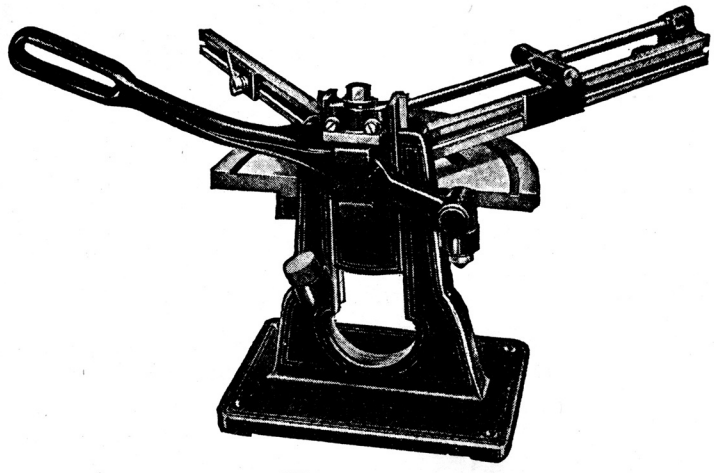


FIGURE 22
The Rouse mitering machine.

the knife-holder, thus permitting the knife to be fed up to the work with each downward stroke until stopped by the inner face of the slots. The rule-holder is located and locked at the desired angle by a

construction that permits changes and insures accuracy. Flaring notches for all useful angles are milled in the periphery of the table. These notches are engaged by the wedge-shaped end of the bolt, which is held firmly in position by a strong spring, while the rule-holder and the table are bound as one by a thumb-screw. The capacity of the Rouse machine is 60 picas; with extension gage, 160 picas.

A small triangular-shaped casting, called a *jointer,* is provided, against which the knife should be held while being sharpened on an oilstone. Its use insures the correct bevel on the edge of the knife—which is important.

Type-High Gages

Although the inexperienced compositor may suppose that all type—whether produced in a type foundry or by means of one or the other type-setting machines—brass rules, borders, mounted electrotypes, half-

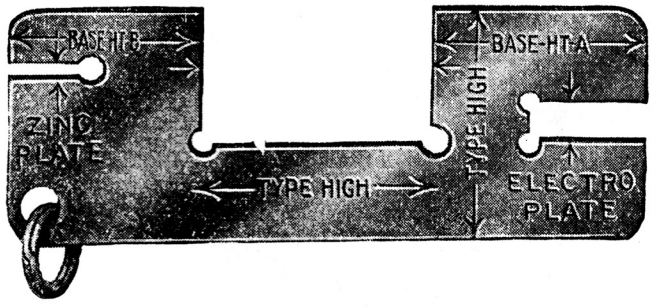


FIGURE 23
A type-high plate and base gage.

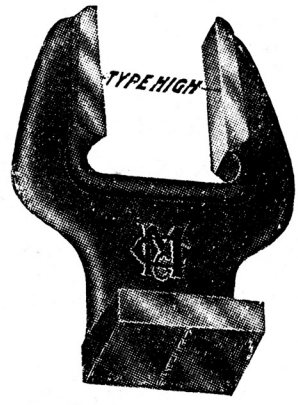


FIGURE 24
A type-high cylinder and bearer gage.

tone and other engravings are of uniform height (0.918 inch), this is seldom the case. No great variation in height exists between the different foundry-cast printing materials, but mounted electrotypes and engravings rarely present a uniform height of face. The difference in this height can not be detected with the naked eye, nor can it be ascertained with a line-gage. Before a form containing type, cuts, rules, etc., can be printed, its surface or height-to-paper must be uniform, and the nearer the various parts of a form approach absolute uniformity, the shorter will be the time required to make it ready after it is placed on the press. It is the duty of every careful compositor to see that his work is in reasonably good condition in this respect, as well as to have his lines

properly justified, when it goes from his hands to the imposing table or the press. To aid the compositor, a convenient tool is at his disposal, which is called a *type-high gage*. With this he can easily test any engravings, plates or material from which printing is to be done.

The use of type-high gages by the compositor on any printing material of doubtful height, together with the prompt rectification of inaccuracies, will not only save expensive time and delay during the later stage of the work, but, in case of over-high plates, it will prevent the injury of the surface of such plates while proofs are taken of the form. While handling this tool, a necessary precaution is to see that the surfaces of the engravings are not scratched while the jaw of the type-high gage is slipped over it in testing for height.

There are several styles of gages on the market, two of them being illustrated here. Nearly all gages can be used for testing the height of mounted plates or engravings, the standard thickness of unmounted zinc (0.068 inch), halftone copper (0.069 inch), and electrotype plates (0.152 inch), as well as the two heights of plate bases. They may also be used for checking the height of cylinder and press bearers. Some gages are made especially for adjusting and checking cylinder press bearers.

With the tools here described, or similar ones, the stoneman can determine the necessary *inter-lay* to place between the unmounted plates and the bases in order to bring all the plates in the form to a uniform height, thus saving the pressman the time and trouble of unlocking the form to do this after it is placed on the press.

Type-High Planers and Saw-Trimmers

The mere testing of printing plates with type-high gages will not always improve the compositor's or pressman's work as much as desired. Even after interlaying and underlaying have been done, some inequalities will be apparent. These inequalities, in the case of engravings or electrotypes which are mounted on wood or metal bases, are frequently due to slightly high or low, or slightly curved or convex plate-mounts or bases, and these should be made accurately level before they are locked up. This may be accomplished with the aid of *type-high planers*.

There are several good type-high planers on the market, and at least a theoretical knowledge of how to handle them should be acquired by every all-round compositor. Most of these machines are so-called combination machines, on which some of the following operations may be performed: Sawing, trimming, type-high planing, mitering, grinding,

under-cutting, mortising, notching, beveling, rabbeting, routing, drilling, jig-sawing and broaching.

Caution: Many of the small machines of the printshop are driven by electrical or some other mechanical power, and although all wheels and gears are protected as much as possible with safety appliances to prevent accidents, no machine is absolutely fool-proof. A word of advice to the person who is unfamiliar with the mechanism of planers and saw-trimmers will not be out of place here. Before attempting to use any machine, ask someone to show you how; never allow your fingers or hands to come near a moving saw or the gearing of a machine—first shut off the power.

An apparatus for type-high planing usually consists of a flat steel table on which the printing plate is held face-down. One style has a cutting or routing tool in the side of a large wheel which rotates horizontally over the base of the block. Other styles have either regular revolving planer-knives or straight-pull knives. An essential feature of

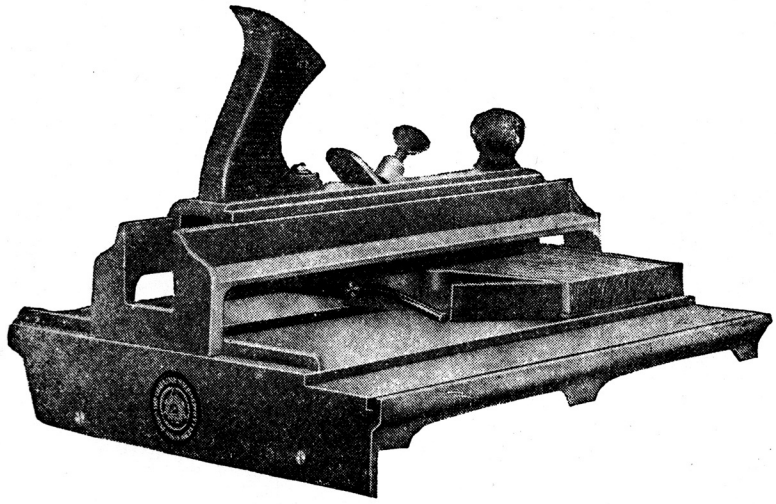


FIGURE 25

The Hoerner shute-board and type-high planer.

these machines is a place to hold the block which is to be trimmed without injuring its face while a cutting tool shaves off the bottom smoothly all over. The block must be trimmed so that it will lie perfectly flat on the imposing surface, with no tendency to rock on the corners. It should be left no more than type-high; if there is any variation in height, it should be slightly less, rather than more, as the height of the face may be easily raised by underlaying with paper or card stock.

Making the block type-high is, however, not all that is required in order to obtain the best results in printing. The exact trimming of the sides of the block are also of great importance. The sides of a block

should be at precise right angles to the top and bottom. Any variation in this respect will be likely to result in an uneven lock-up of the form, preventing it from lying solidly on the imposing table, or, if it is apparently square, there is likelihood that it will later spring up in the form on the press.

Hoerner Shute-Board and Type-High Machine

The Hoerner machine contains both a knife- and file-plane by means of which printing plates can be made type-high and squared up. The device may also be used for mitering rules and borders, for trimming leads and slugs, and for beveling unmounted plates. Care should be taken not to damage engravings that need rectifying while they are being clamped into, and while operating, the machine. All plates are usually laid face-up on the metal bed of the machine; but when it becomes necessary to place them face-down, a protection of press-board or strong card stock should be placed over the bed-plate of the machine.

The Hacker Plate Gage

A practical machine for correcting inaccuracies in the height of printing plates is the Hacker plate gage, with equipment for the making of preliminary underlays. This is a device for measuring line engravings, halftones, electrotypes, etc., under actual printing pressure, and applying an advance underlay in order properly to compensate for discrepancies when the pressure of the printing press is applied. The inspection and preparation of printing plates for the pressroom or electrotype foundry is an essential of modern production efficiency. The work of leveling them and establishing the proper

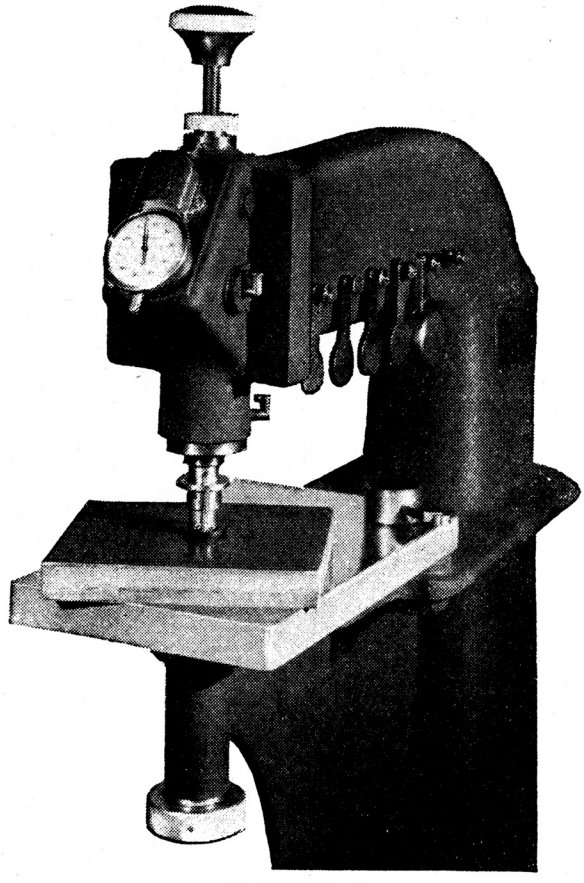


FIGURE 26
The Hacker plate gage.

printing height (0.918 inch) can be done, and should be done, before the plates are locked up. With the Hacker device, the plates are measured on the gage and departures from type-high are indicated on a dial. They are then underlaid with paper of the proper thickness.

Miller Universal Saw-Trimmer

The Miller Universal Saw-Trimmer saws and trims in one operation, gaging to the American point system. (Gages cut to the Didot or French point system can be applied to the machine.) The combination of a saw-blade and a trimmer-head in one, so that they act simultaneously, is the basic principle of the machine. The saw and trimmer are mounted on the same mandrel, with the trimmer-knives projecting through the saw-blade. The knives, when changed for sharpening, should be accurately re-adjusted.

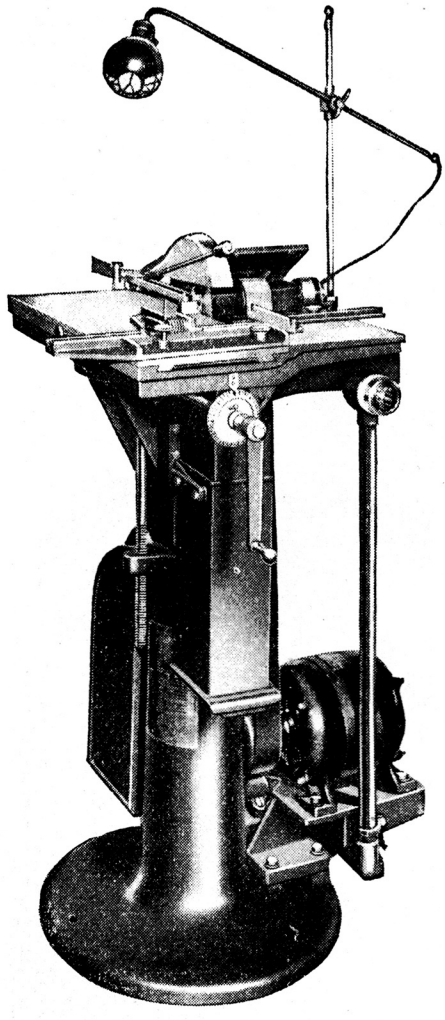


FIGURE 27
The Miller
Universal Saw-Trimmer.

The micrometer gage is adjusted to points and fractions of points by turning the knurled worm. The right-hand graduations on the worm gage the lengths; the left-hand graduations, when used in conjunction with batter, gage the miters. To change the adjustment, the gage may be lifted free from the rack and moved forward or backward as in the ordinary quick-acting vise. It locks automatically when dropped back into place. The gage has a capacity of 60 picas and is accurate to one-thousandth of an inch. To gage lengths in excess of 60 picas an extra gage is obtainable which gives the machine a capacity up to 160 picas.

The free-sliding main table of the machine is equipped with an elevating mechanism whereby it is raised and lowered in relation to the sawhead. This mechanism is controlled by a micrometer-point dial

which is marked by points and half-points up to two picas for one revolution. The Miller machine is useful for sawing wood or lead plate-bases, and for cutting slugs, machine composition lines, etc., in quantities, as well as for other work.

General Instructions: All the tools, accessories, and appliances of the printshop are intended for certain definite mechanical operations and serve a special purpose; consequently, each tool or device has its own particular *use.* If tools are incorrectly used or *abused,* they are broken and gotten out of order, so that they become *useless.* Examine each tool or device carefully, and do not attempt to use it until you understand its mechanism. Only a few of the many mechanical devices and contrivances which are to be seen in the modern printshop are described in this book. New tools are constantly appearing to simplify and improve the work of the printer. Such devices as the lead-cutter and the mitering machine are easily gotten out of order, and, in the pressroom or bindery, the paper-cutter can easily be damaged. See that you do not *mis-use* them.

CHAPTER VI

PROOF PRESSES

The early printers had no proof presses upon which to take their proofs. The type was set and first placed upon *wooden slice-galleys,* from which it was later pushed onto the imposing stone, or it was set direct into a chase or frame. (A German authority claims that Gutenberg's compositors set one line of type at a time into a crude stick, and then transferred it to a slice-galley.) The type was made up, imposed and locked in the chase before it was read. After the form was locked up it was proved on the hand press; the proof was read, and then the form was corrected on the imposing stone. Perhaps very few revises were taken, but whenever a revise was necessary, the form had to be put back on the hand press, which press also printed the sheets for the book. (See illustration of Badius press, in Chapter III.)

The first mention of a proof press, in the United States, occurs in the *History of R. Hoe & Company,* by Stephen Tucker, who wrote: "I happened in a composing room in Boston just about that time [1840] and saw a novel manner of taking proofs. Two bars of square iron, about type-high, were lying across an ordinary imposing stone and carried a small iron roller. A galley of matter, or small form, was placed between the bars, the paper and a blanket were laid on, and the roller passed over them and back. This seemed such a simple and quick way of taking proofs that the firm [R. Hoe & Company] decided to bring out a proof press of this style in proper form."

The proof press is a labor-saving machine, and today it has practically replaced the mallet and planer in modern printshops as a means of making proofs of ordinary jobs. There are a number of styles of proof presses on the market, and although the mechanical principles of operation differ slightly, they all produce proofs by pressing the paper against the surface of the type, which has been covered with ink, thereby transferring the image of the letters to the paper. Proof presses may be divided into two general classes: those in which the impression roller or the cylinder travels over a *stationary bed,* and those which have a

movable bed that passes under a rotating impression cylinder. Practically all so-called roller proof presses have stationary beds.

The Roller-Press

A very common style of proof press is the so-called felt-blanket, gravity-pressure roller-press, which was developed from the first Hoe proof press. It has an iron frame, upon which is mounted a flat metal bed the length and width of the frame. On each side of the bed is a steel ledge, forming a track on which an iron roller or cylinder, which is covered with felt-cloth and paper or a rubber blanket and paper, may be rolled

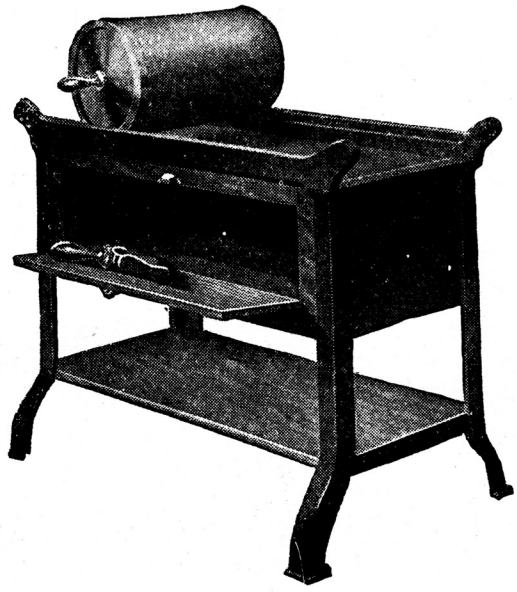


FIGURE 1

A roller proof press.

from one side of the press to the other. The type that is to be proved is placed in the bed of the press, and after it has been inked with a small ink roller, the paper is placed upon it and the press-roller drawn over it, its weight giving the impression to make the proof.

The roller-press, as well as all other proof presses, requires accurate adjustment in order to produce good proofs. The pressure of the roller or cylinder may be increased by placing a sheet of paper under the galley on the bed of the press. Care should be used in regulating the pressure on proof presses, because too much impression will injure the type. Only enough pressure should be used to make a good legible print. If the letters sink into the paper and show on the unprinted side of the sheet, it is an indication that there is too much packing on the cylinder

or that there are too many sheets of paper under the galley on the bed of the press. Thick paper or cardboard would have the same effect.

Caution: Never attempt to take a proof of type while it is in the composing stick; this may ruin the stick and the type. If you learn to operate a modern proof press properly, you will also understand the fundamentals of *platen* press work. The hand press embodies the simplest fundamentals of the principles of impression in use on power presses.

How to take printers' proofs is also explained in Chapter XI.

Vandercook Rigid-Bed Composing Room Cylinder

This press is made in several sizes and has a rigid and immovable bed. The cylinder, to which all moving parts are attached, is geared to

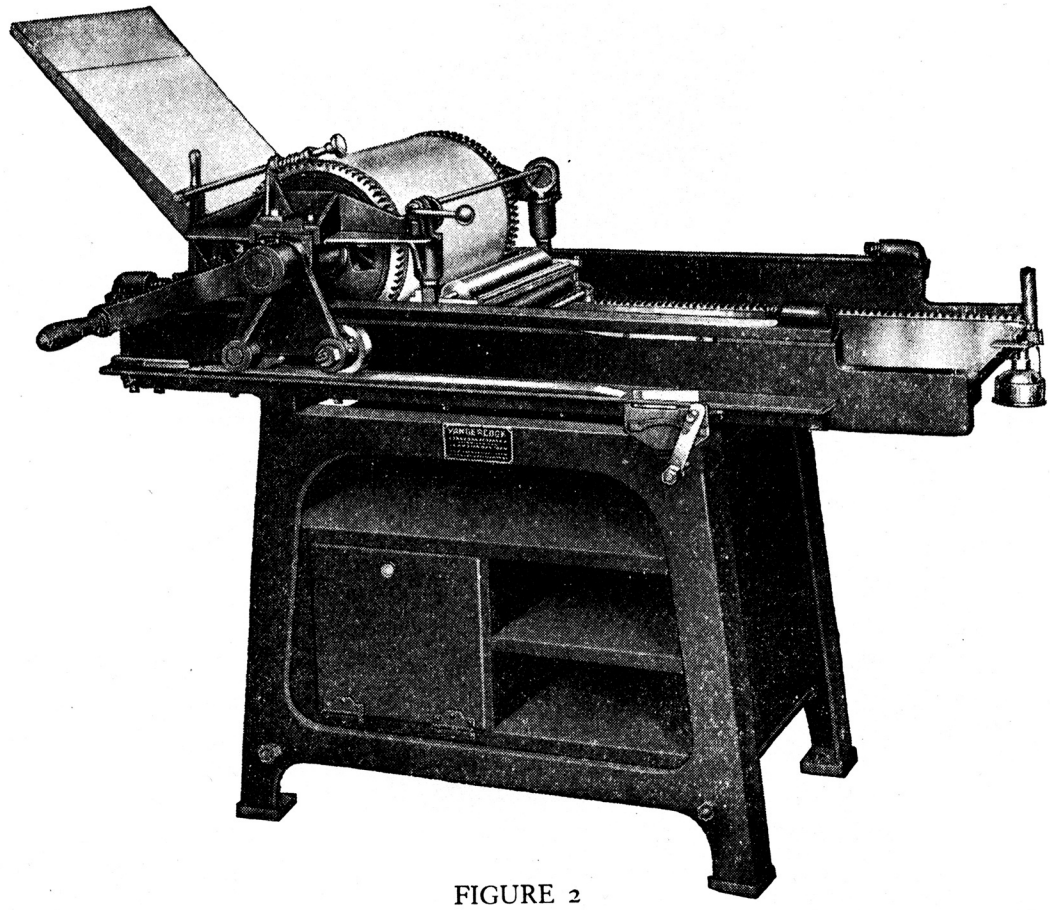


FIGURE 2

The Vandercook composing room cylinder press.

the racks and is held firmly, by a set of substantial roller-bearings, upward against downward-facing impression rails which extend out from the bed of the press. The impression is made by turning a crank lever with the hand. The cylinder prints only one way of its travel. On the

return stroke the cylinder rises from the printing line by means of the shifting of the wheels that hold the cylinder to the cylinder bearers. On the return stroke the impression wheels are automatically shifted by wedges so that the wheels come into line with the upward-facing tracks on the side of the press.

The inking system of the press is automatic, and consists of an ink plate, two form rollers, one vibrator with a 4-inch lateral travel, and three small parallel riders. Each of the form rollers is direct gear-driven, and their rotation does not depend upon contact with the form as they pass over it. This system will ink a single unsupported letter without disturbing it or a full-size form without any change in adjustment.

The inking rollers may be tripped so that sheets may be laid on the form and not fed to the grippers when one or two copies are all that is required without close register. The feed mechanism and grippers are used where a number of copies and close register are wanted.

The No. 1 Vandercook proof press, constructed on the same mechanical principles as the larger press, is 12 by 18 inches in size, but full-length galleys can be proved on it in two impressions in either direction, by sliding the galley along after the first impression. Inking is done with a hand-roller. A registering device or bar may be attached to the bed, which facilitates the taking of proofs in colors, from separate forms.

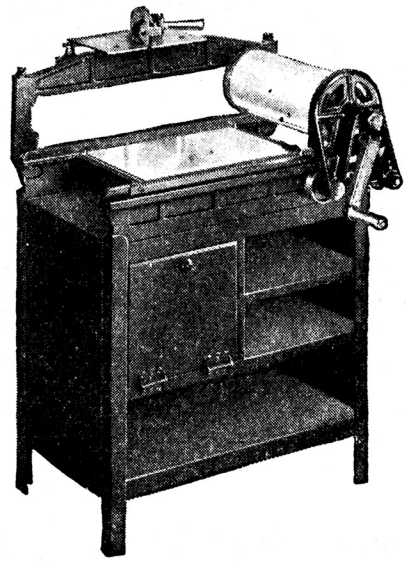


FIGURE 3

The No. 1 Vandercook proof press.

Instruction: Obtain the proper margins on the first form with furniture placed at the top and sides of the form; take an impression on a piece of transparent paper, tracing cloth or a sheet of celluloid, fed to the guide-bars on the bed of the press; run off as many proofs as required and several extra for registering the other colors; register the next color by means of the celluloid or transparent sheet held to the guides, using furniture for approximate register and the four set-screws on the guide-bars for close register.

Potter Press

This press is made in three styles and three sizes, 12 by 25 inches, 17 by 25, and 25 by 25 inches (printing capacity), with or without automatic inking device and feedboard attachment. The cylinder is

geared to a reciprocating or movable bed. The paper for the proof may be laid directly on the form, which is the faster method, or it may be fed around the cylinder, which gives the better proof. Feed guides and grippers make possible the registering of margins and color plates. A foot-trip prevents offset on the return stroke.

The automatic inking device consists of two form rollers, 2½ inches in diameter, one steel vibrator, three idlers or distributors, and one drum feed-roller (which is equivalent to a fountain), 3½ inches in diameter. The vibrators and idlers can be lifted as a unit. The drum feed-roller

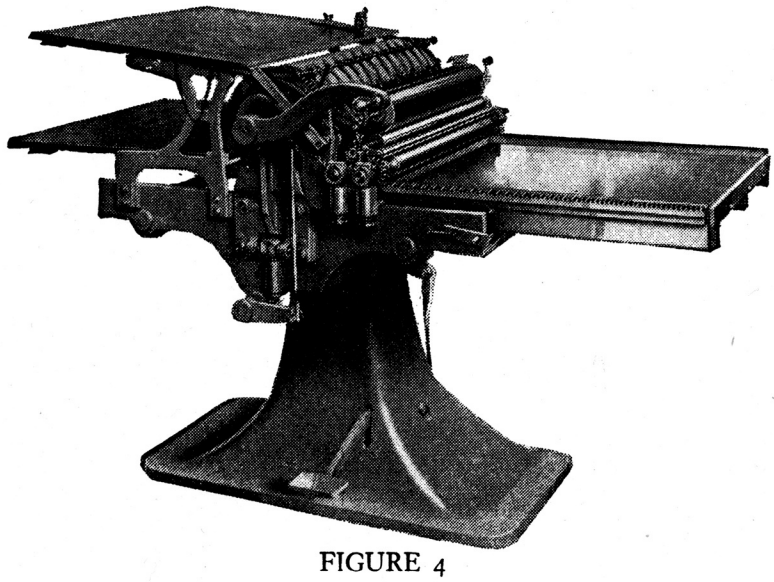


FIGURE 4

The No. 3 Potter proof press, with inking device and feedboard.

moves down to contact with the vibrator once per stroke of bed with a fresh supply of ink. It is adjustable for long or short contact, according to the amount of ink required and the amount of ink on it. Ink is laid directly on the drum feed-roller and distributed thereon by means of an idler and a small crank.

Power Proof Presses

There are several proof presses in which the motive power is electricity, and this operates the press by means of a treadle, sometimes near the floor. Depressing the treadle starts the motor and mechanism going, and merely releasing it stops the press. The electric proof press is used in newspaper composing rooms where many proofs of galley-matter are taken, and where speed in *pulling* proofs is important.

There are other first-class proof presses on the market, their mechanical principles differing slightly from those described and illustrated in this chapter. Among them may be mentioned the Wesel, Claybourne, Poco, Brower, etc.

The Washington Hand Press

Among the older proof presses is the style known as Washington hand press, which was developed from the Smith press of 1822, built by R. Hoe & Co. In 1827 this press, which imparted the impression by

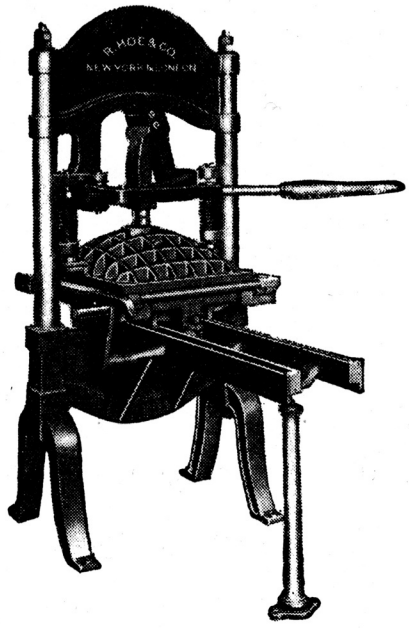


FIGURE 5
A Washington hand press.

means of a toggle-joint in place of a screw with levers, was improved in construction, and it has since been manufactured under the name of Washington press. Like the roller-press, this style of press is operated by hand, but their mechanical principles are not the same. To the beginner they may seem a bit complicated, and for this reason he should have a clear understanding of such a press before attempting to take proofs thereon. When properly adjusted, this kind of press can produce very fine proofs, and for that reason it is used by photo-engravers, who require the best quality of printed proofs, taken of different kinds of engravings, under variable pressure.

Instruction: In pulling proofs on the Washington or a similar press, proceed as follows—Place the galley containing the type or other printing

surface in the middle of the press-bed. See that the *bearers,* which are type-high pieces of hard wood or metal (used to equalize the impression and bear off any undue force against the edges of the type), are placed around the galley. Apply the ink; lay on the proof paper, and then lower the *tympan.* Now run the bed slowly under the *platen,* by turning the crank-handle, until the type is exactly under the center of the platen. By pulling the hand-lever over toward the center of the press, the spindle, which is located between the two upright posts, exerts a downward motion, impressing the paper upon the type. A careful student will soon learn to gage the amount of pressure required on the form by the resistance which he feels when he pulls the lever or bar. Finally, run the bed out, raise the tympan, and remove the proof. It will show whether or not the impression was just right, too much, or too little.

Franklin Press

Benjamin Franklin, while he was learning the printer's trade, in his brother's shop, used a style of hand press which, in mechanical principle and shape, was somewhat like the Washington press, although it was made entirely of wood. This press was known as the *Ramage* press. Franklin's press is still in existence; it stood for many years in the Old State House, but it is now in a glass cabinet in Mechanics Building, Boston, Mass. The press which Franklin used while he was in England is in the Smithsonian Institute, Washington, D. C.

The First Hand Press

Although no accurate description or drawing of the first press used by Gutenberg and his associates is available, it is thought by historians that the first press consisted of two upright beams and a cross-beam, a spindle or winding screw, to which was attached the platen. Under this was a stationary or movable bed. The upright beams were probably braced or wedged against the rafters of the ceiling in order to give them stability. (See illustrations of ancient presses in Chapter III.) The present-day Washington hand press is a development, with many improvements, of the first hand press.

CHAPTER VII

THE CHARACTERISTICS OF PRINTING TYPES

The manufacture or casting of printing types is called *type founding*. For more than a hundred years after the invention of typography, type founding and printing were included in the general term of printing; printers designed, cut, and cast their own types, and printed their books. The illuminating and the binding of the books were usually done by other craftsmen. Early in the sixteenth century type founding became a distinct and specialized vocation.

The type character is one of the wonders of mechanical production. In its final form it must be an absolutely perfect product. Its shape, its angles, its height, size, and set, the design on its face, the beard, the serifs, the shoulder, the counter, the nick, feet, and groove are all gaged to micrometer exactness.

The utility of printing type depends upon exact uniformity of the size of all the types assembled in a line, upon their squareness of body, and upon their conformity to the established standard of height. Exact uniformity of body is necessary in order that the types, when composed in lines and pages, may be locked together by pressure at the sides so as to make a compact mass. All types in a printing form must be of the same height, so that their faces will present a uniformly level surface from which an impression may be made that will show all the characters clearly. A type that is shorter than its mates will print faintly or will not print at all; one that is higher or longer will be unduly forced into the sheet that is being printed.

Composition of Type-Metal

Type is made of a metal alloy, and the chief constituents of this alloy are lead, tin, antimony, and copper. Although the largest percentage of the type-metal is lead, the antimony is added to harden the mass; the tin has a tendency to toughen it, and the copper increases its durability.

Numerous recipes for the formulas of type-metals have been printed, but the percentages of each metal in the alloy have never been exact;

they were only approximate. It is a well-known fact that each type founder has his own secret formula. Here are several recipes taken from books on type:

Formula 1—Lead, 100 parts; antimony, 40 parts; tin, 20 parts. Formula 2—Lead, 55 parts; antimony, 22.7 parts; tin, 22.3 parts. Formula 3—Lead, 69.2 parts; antimony, 19.5 parts; tin, 9.1 parts; copper, 1.7 parts. Formula 4—Lead, 70 parts; antimony, 18 parts; tin, 10 parts; copper, 0.2 part.

From an examination of these formulas it will be seen that lead is the basic metal in all recipes. The formulas are not the same for all sizes of type. If the normal mixture used for casting type contains 5 parts of lead, 2 parts of antimony, 1 part of tin, and 0.02 part of copper, this mixture may be suitable for type ranging in size from 7 to 12 points; but for 6-point or smaller bodies the lead percentage would be reduced, and the tin and antimony increased in proportion. For the larger sizes, 18- and 24-point and upwards, though the lead remains the same as in the normal mixture, the antimony would be increased and the tin would be decreased in proportion. Antimony is brittle and gives hardness, and tin imparts toughness to the mixture. Lead and antimony, when mixed in proper proportion, will make an alloy which has the unusual quality of expanding slightly (instead of shrinking) when cooling, thus permitting a full, sharp cast in all parts of a mold. Tin flows readily when melted and increases the smoothness of the cast on the surface of the mold; and, finally, a small quantity of copper and arsenic may be added to give the mass still greater hardness.

The formulas and explanation given refer more particularly to type cast in regular foundries. The metal used in Monotype casters contains a larger proportion of lead, and a smaller proportion of antimony. Linotype metal is composed of a still larger proportion of lead and very little antimony and tin.

Casting-Machine Metals

Linotype, Intertype, Linograph, Ludlow, and other so-called casting-machine metals should contain: 85 per cent lead, 11 per cent antimony, 4 per cent tin.

Standard Monotype metal should contain these percentages: lead 72.00, antimony 19.00, and tin 9.00.

Combination Linotype and stereotype metal percentages: lead 83.75, antimony 12.00, and tin 4.25.

Newspaper stereotype metal percentages: lead 81.00, antimony 13.50, and tin 5.50.

Regular electrotype metal percentages: lead 94.90, antimony 3.10, and tin 2.00.

How the Matrix Is Made

The first step in the production of printing types may be said to begin with the plan, design or drawing of the alphabet, both capitals and small letters, together with the other characters that are to go into the font. This drawing is usually made by an artist or designer, who draws each letter to an enlarged scale.

The next step is the making of the *counter-punch.* The counter is the sunken part of each character, as that part above and below the sloping lines of the M (which is usually the first letter that the counter-punch

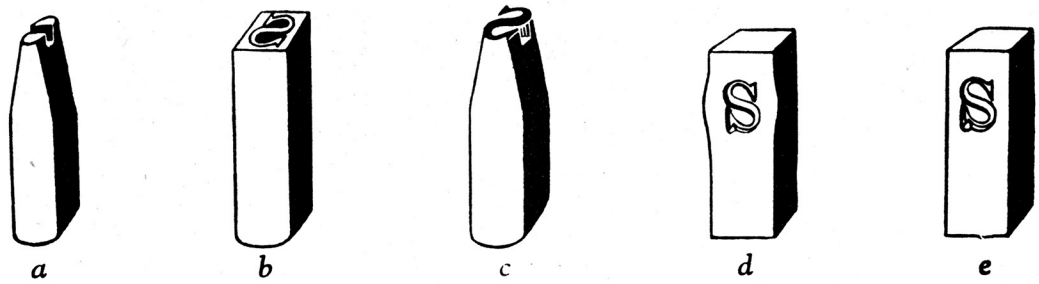


FIGURE 1

Progressive steps in producing a matrix. *a,* the counter-punch; *b,* counter-punch drive; *c,* finished punch; *d,* strike or rough matrix; *e,* finished matrix.

cutter makes), and the center or open part of the S. See Figure 1. The letter is drawn on the end of a small bar of soft steel. The blank part of the letter is cut away, allowing the shape of the counter to stand in relief, which, after the counter has been perfected, is hardened, and is then used to make the *counter-punch drive.* This is done by taking another bar of soft steel and by driving the counter-punch into one end of it. The force of the *drive* results in a very rough and ragged outline of the letter standing out in low relief all around the sunken part. This raised portion, after considerable tooling and finishing, finally becomes the character from which the matrix is made. When the letter is perfected, the soft steel is hardened, and the punch is now ready for the *strike.* The punch is stamped into a bar of copper. This produces the *matrix* in the rough. After it is smoothed down around the sunken impression, with its sides trued up and finished, it is ready to be placed in the mold.

Formerly all letters were cast by hand in copper matrices in a steel hand-mold. The punch-cutter fashioned the letter or character with simple tools, and depended upon his artistry and craftsmanship for the quality and perfection of his work. Today, however, very little hand-cutting of punches is done. The matrices are made in a more or less mechanical manner, as described in the third method (on page 113). The casting of the types is also mechanical.

The number of characters required for a font of type for printing books is not the same in modern roman and italic as it is in oldstyle roman and italic.

The modern roman includes: lower-case letters a to z, with double letters (ligatures) fi, ff, fl, ffi, ffl, ampersand (&), and diphthongs æ and œ (diphthongs are not recognized as belonging to the English language, or so usable); the points, reference marks, figures, capitals A to Z, with diphthongs; small capitals A to Z, with diphthongs; dashes and braces.

The modern italic font includes capital and lower-case letters a to z with diphthongs and the ligatures above specified, but no small capitals.

The oldstyle roman and italic fonts for book work include all of the characters enumerated for the modern roman and italic, with the addition of the long ff, fi, fl, ſt, ſh, ffi, ffl, ffh and ct.

The First Independent Type Foundry

Claude Garamond, who was an apprentice of the great French typographer, Geoffroy Tory, in 1525, is reported to have established the first type foundry separate from a printing house, and in this foundry he worked under Tory's direction. In Tory's book on the proportions of letters he has an engraving of the letter A reversed, which he says, "is done to help, and give hints to, goldsmiths and engravers, who, with their burin, graver, or other tool, engrave and cut an ancient letter reversed, or, as we say, to the left, so that it may appear to the right when it is printed . . . so that no one may be misled, for I have seen, and do see, many persons who are misled. Before the letter to be printed is finished, it is made twice reversed and twice to the right. In the first of the reversed there are the punches of steel in which the letter is wholly left-handed. The matrices have the letter to the right. The letter then cast is, as I have said of the punches, left-handed. Then, finally, on the printed paper, the whole appears to the right, and in its proper aspect to be read."

Another method of producing a matrix is by means of the electrotype

method, which consists in first securing a model or pattern of the letter. This pattern may be engraved by hand or by mechanical means, or it may be a perfect type-face already cast. A brass plate (about 1½ to 2½ inches long, ¼ to 1½ inches wide, and ¼ inch thick), with a square hole near one end, is then provided, and the pattern-letter is so fitted in this opening that it will have some open space around its face. A number of these brass plates, with their pattern-letters, are then arranged and fastened side by side in a flask. This flask is next entirely covered with wax, except at the square openings in the brass plates. These openings, containing the faces of the pattern-letters, are thus exposed, and the flask is then hung on a rod in an electro-galvanic battery. Here the copper, held in solution of minute particles, is deposited on the exposed portions of the flask until it forms a thick shell and fills up the spaces between

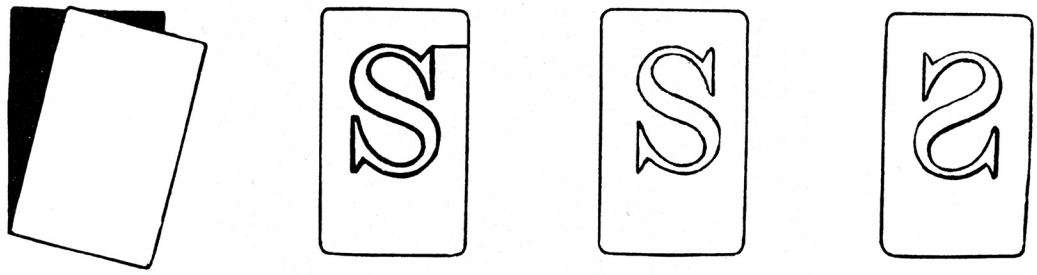


FIGURE 2

Progressive steps in making a letter-pattern. *a*, polished brass plates; *b*, incised tracing of letter; *c*, finished pattern for punch-cutting; *d*, finished pattern for matrix-cutting.

the sides of the square and the pattern. In a few hours, more or less, the flask is taken out, the wax removed, and the pattern-letter withdrawn from its copper bed, leaving a perfect image in copper securely fitted in the brass plate. This brass plate is now an unfinished matrix, and requires to be smoothed off on all sides, reinforced by another brass strip riveted to its back, and finally fitted for the mold.

The Matrix-Cutting Machine

The third method of making a matrix is with a matrix-cutting machine. This machine was invented by Mr. L. B. Benton of the American Type Founders Company, and in mechanical principle is something like a pantograph. In the upper part of the machine is placed the bar of metal—the future matrix. Above this, pointing downward at the proper position, is a rapidly revolving hardened steel needle which cuts the

design in the matrix. The cutting needle is held in the center of a finely adjusted, moving steel frame. This frame, with its revolving needle-point, is controlled in all its motions, horizontally and laterally, by a rod suspended below; by moving the lower end of this rod over a given diagram, all its motions are duplicated on a smaller or larger scale by the cutting needle above. It will thus be seen that the thing necessary to produce any design in a matrix is a pattern to be placed on the lower

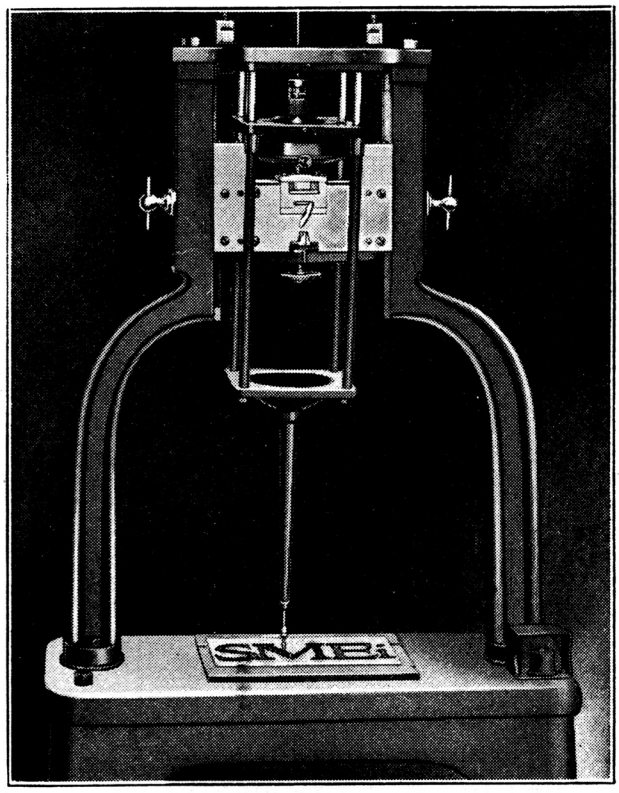


FIGURE 3

The Benton matrix-cutting machine. Brass pattern-letters are shown on the lower shelf of the machine.

shelf of the machine, under the point of the suspended rod. One pattern may be used for cutting matrices for several different sizes of the same letter by simply adjusting the machine to the size desired. All these operations in producing a matrix are mechanical.

There are several things about a type matrix which require skill and accuracy on the part of expert workmen. The outer surface must be exactly parallel to the face of the sunken letter, so that the face may be absolutely level on the top of the type-body. All the matrices of a font, and of all fonts cast in the same mold, must be of the same depth from

the surface to the sunken face. The matrix must be fitted so that it leaves the face standing exactly upright, with proper shoulder on each side,

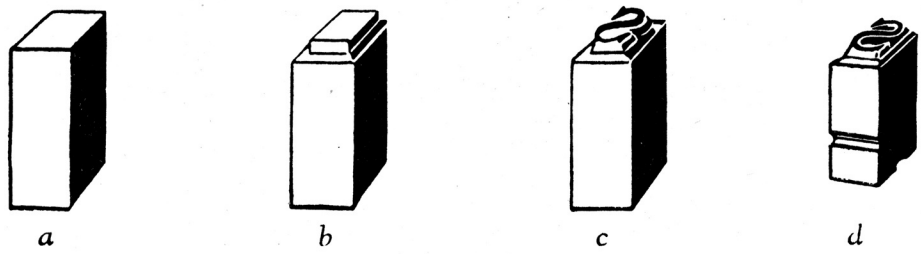


FIGURE 4

Progressive steps in cutting a punch by machine. *a*, copper or brass parallelogram; *b*, the metal bar with the shoulder cut; *c*, the finished punch; *d*, the completed type.

and on true alignment with other letters in the font. Fine precision instruments are used by the matrix-cutter and mold-maker for the minute calculations that are needed to make a finished matrix.

The Type Mold

The two chief factors required in casting type are: A *mold,* in which the body is cast; and a *matrix,* which faces one end of the closed mold and has in it the depressed image of the letter to be cast.

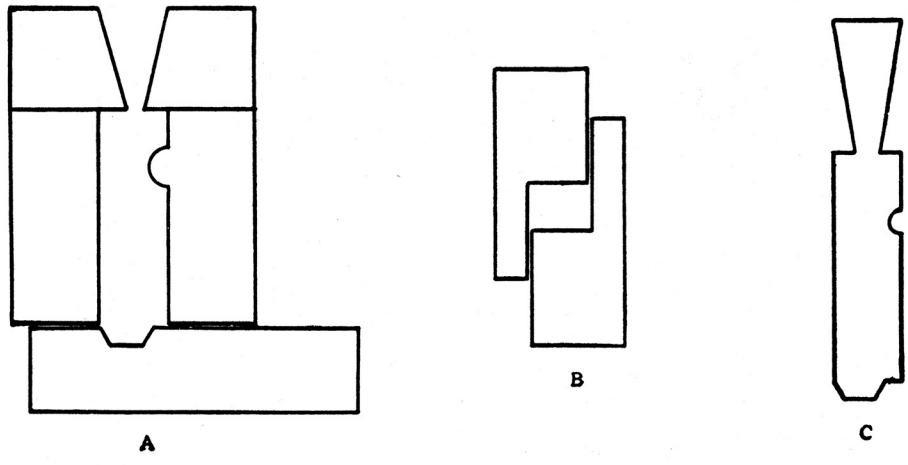


FIGURE 5

Schematic drawings of a hand-mold, and an unfinished type. A, longitudinal section (the lower part is the matrix); B, a cross-section of the sides, adjustable to the width of the letter; C, a type as it leaves the mold, the face at the bottom, the jet at the top.

Until well into the nineteenth century, types were cast from matrices in small hand-molds, the output from which was about 400 letters an

hour. The mold consisted of two portions fitting closely to each other and containing the matrix with a space to receive the metal for the shank. Holding the mold in his left hand, the operator poured in the metal with his right, and after jerking it at arm's length, to bring the metal well up against the matrix, opened the two halves and threw out the type. (See Chapter III, pages 50 and 51.)

Type-Casting Machines

The Bruce type-casting machine, which was invented in 1838, was operated in substantially the same manner as the hand-mold, but in this machine the production was increased to about 100 a minute for ordi-

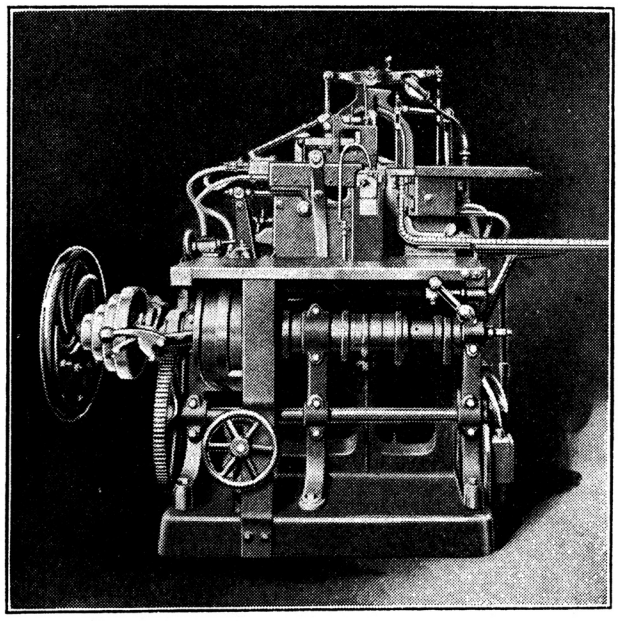


FIGURE 6

The Barth type-casting machine.

nary sizes. The hot metal was pumped into the mold, which at every revolution of the axle came up to the spout of the pump, received a charge of metal, receded, opened, and discharged the type. But neither the old hand-mold nor the Bruce machine produced finished types. To the bottom of each type there was attached a wedge-shaped *jet*. This had to be picked off by hand; the burr on the *shoulder* of the type had, also, to be rubbed off, and the *groove* had to be cut into the bottom to form the feet. It was not until the end of the nineteenth century that the automatic type-casting machine came into general use, but today it is practically perfect. This machine produces complete finished types, ready to be shipped to the printer, at the rate of 15,000 per hour.

In the Barth type-casting machine (which is the machine used by the American Type Founders Company) the mold is non-opening. (The mold on the Bruce machine opens to eject the type.) The type, as it is cast, is ejected by a blade the exact size of the type-body, which also, in pushing out the type from the mold, cleans the mold for the next cast. A high rate of product on small types is about 250 a minute. As the type emerges from the mold, the jet is broken off, the bottom groove (forming the feet) is cut, and the burrs on all corners of the cast are taken off by a succession of knife-edges, after which the types are deposited, set up, on long wooden sticks, ready for examination and for paging. The metal force pump on the Barth machine is very similar to that on the Bruce. On the Barth the mold is kept to a uniform temperature by water which flows constantly around the casting areas, and by compressed cold air which is blown upon the mold. The Barth machine automatically accomplishes the following processes, each one of which is a separate operation and must be performed by a separate person, on the Bruce machine: (1) casting; (2) breaking; (3) rubbing; (4) setting; (5) dressing. One experienced man can operate two Barth machines, and frequently three machines can be run by one operator.

Like any other complicated machine, the type-caster requires careful regulation. The composition of the type-metal alloy must be kept at a uniform temperature of about 850 degrees Fahrenheit, so as not to volatilize the antimony it contains; the pump must work up to a pressure of 150 pounds to the square inch, and the mold-slots are cooled by an elaborate system of water circulation.

CHAPTER VIII

NAMES AND SIZES OF TYPE

In order that we may distinguish different fonts of type of the same size, one from the other, all printing types have names denoting their style, design, or general characteristics. These names are frequently the same as the names of the original designer and maker of the particular types to which they are now attached. During early days, before the adoption of the *point system,* printing types had a so-called size-name, which was arrived at more or less haphazardly. Arbitrary names were given to certain sizes, and in many cases types which bore the same name but were made by different type founders, varied so much in size that they could not be used together without great inconvenience to the printer. Some of these old names still survive and are applied to the point-system bodies which approximate the old sizes. The old nomenclature is, however, rapidly becoming obsolete. The names *Pica, Nonpareil,* and *Agate* are still in general use; *Pearl, Minion, Brevier, Bourgeois, Long Primer, Small Pica* are used in some shops, but the other old names are now rarely heard. All the old size-names, with the point-size opposite each name, are shown in the table on the next page. At first the name was descriptive of both body and face, but later it was applied to the body only.

The pronunciation of the words of foreign origin is here shown: Pica (pi′ka); Nonpareil (non′pa-rĕl′); Brevier (brē̆-vēr); Bourgeois (bûr-jois′).

The *size* of a type is its height or length (the thickness of its body)—the depth of a line up and down the page; the width of a type is called its *set.* Thus a 12-point en-quad is 12-point body and 6-point set, a 10-point figure of the thickness of an en-quad is 10-point body and 5-point set, etc. The total length of a type, including face and feet, is its *height-to-paper.*

Beginning with 6-point, the usual sizes are graduated by two points up to 14-point (6, 8, 10, 12, 14), then 18-point; larger sizes are multiples of 6-point up to 60-point (18, 24, 30. 36, 42, 48, 54, 60). Still larger sizes

are 72-point, 84-point, 96-point, 120-point, and 144-point—the latter size being the largest type commonly cast in a mold.

In addition to the sizes mentioned, there are several intermediate ones which are not frequently used, such as 7-point, 9-point, 11-point, etc. Sizes smaller than 6-point (4-point, 4½-point, 5-point, 5½-point)

OLD NAMES AND SIZES

OLD SIZE NAMES	APPROXIMATE SIZE IN POINTS
Excelsior	3-point
Brilliant	4-point
Diamond	4½-point
Pearl	5-point
Agate	5½-point
Nonpareil	6-point
Minion	7-point
Brevier	8-point
Bourgeois	9-point
Long primer	10-point
Small pica	11-point
Pica	12-point
English	14-point
Columbian	16-point
Great primer	18-point
Three-line nonpareil	18-point
Paragon	20-point
Two-line small pica	22-point
Two-line pica	24-point
Two-line english	28-point
Two-line columbian	32-point
Two-line great primer	36-point
Two-line paragon	40-point
Meridian	44-point
Canon, four-line pica	48-point

are also made, but type smaller than 5-point is not practical for general use. These small sizes are employed for special purposes, like miniature editions of books (parts of the Bible, prayer books, etc.), cut-in notes, piece fractions, small borders, special characters, and occasional words or lines that are required to be put in the smallest possible space, as copyright lines.

There is one small size, however, known as Agate or 5½-point, which is frequently used by newspapers and magazines. The want ads are usually set in this size. The Agate size (fourteen lines to the inch) is considered the common standard of measurement for advertising space by newspapers and other publications.

Quads are low metal types having a square foot and top, but they do not print in composition. The point-sizes are printed alongside the quads shown in the diagram.

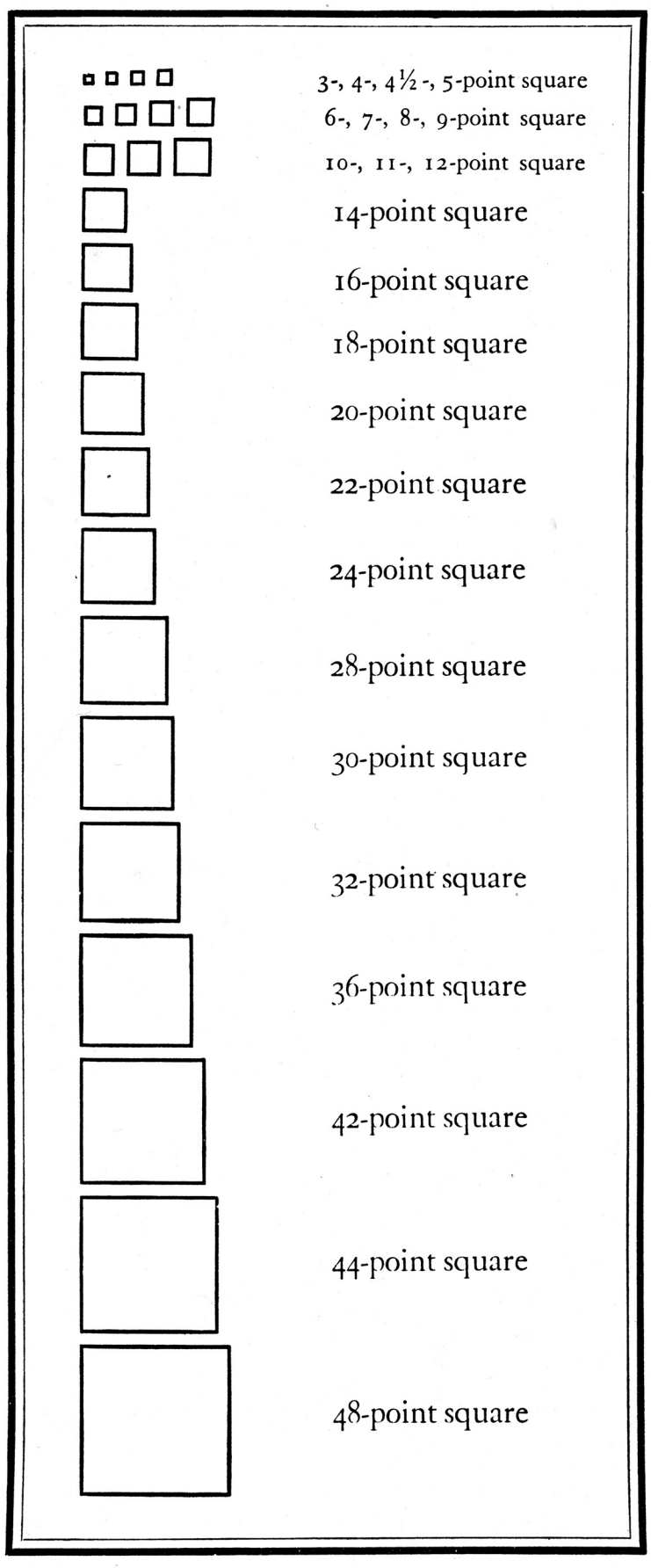


FIGURE 1

The sizes of quads from 3 points up to 48 points.

Not all types of the same body-size have the same size of face; a considerable irregularity exists, and as the face of a type does not cover the entire body, it is difficult to know the exact body-size of a letter by merely seeing it printed on paper.

Different Parts of a Type

It has often been said that printers' types are human. Though not actually human in the literal sense of the word, the type has many characteristics of the human figure. The type has a body, a face, a beard, a shoulder, and feet. (Type is *expressive,* and it *can be made* to "talk" in display composition.)

On the *body,* or *shank,* which is the largest part of the type, will be found all the smaller members.

The *face* consists of the stem, serifs, and, on some types, the kern. The face is on top of the body and is the portion from which the printing is done while it comes in contact with the ink and paper.

The *stem* is the outline of the letter—the main lines of a character, without the serifs.

The *serifs* are the fine horizontal or oblique terminations added to the tops or bottoms of the vertical or sloping main lines of the face. It is the serifs which create the distinction between different designs of types and establish their style.

The *counter* is the shallow part between the lines of the face.

The *beard* (sometimes called the *neck*) is the sloping part between the outside edge of the face and the shoulder.

The *shoulder* is the low flat part, below, above, and sometimes at the sides of the face.

The *pin-mark* is a slight depression (usually on the right upper side of the body). It contains the type foundry's name or the trademark; or the point-size of the type.

The *nick* is the slot, or slots, which are cut into the body at the lower side near the bottom of the type. There are from one to four, variously grouped. The nicks facilitate the composition of type by the compositor; they serve as a guide when he takes the type from the case to his composing stick; and because the position and number of nicks vary in different fonts, they assist in distinguishing one font from another of the same size of type.

The *groove* is the hollow part at the bottom running across the width of the body, thereby forming the feet.

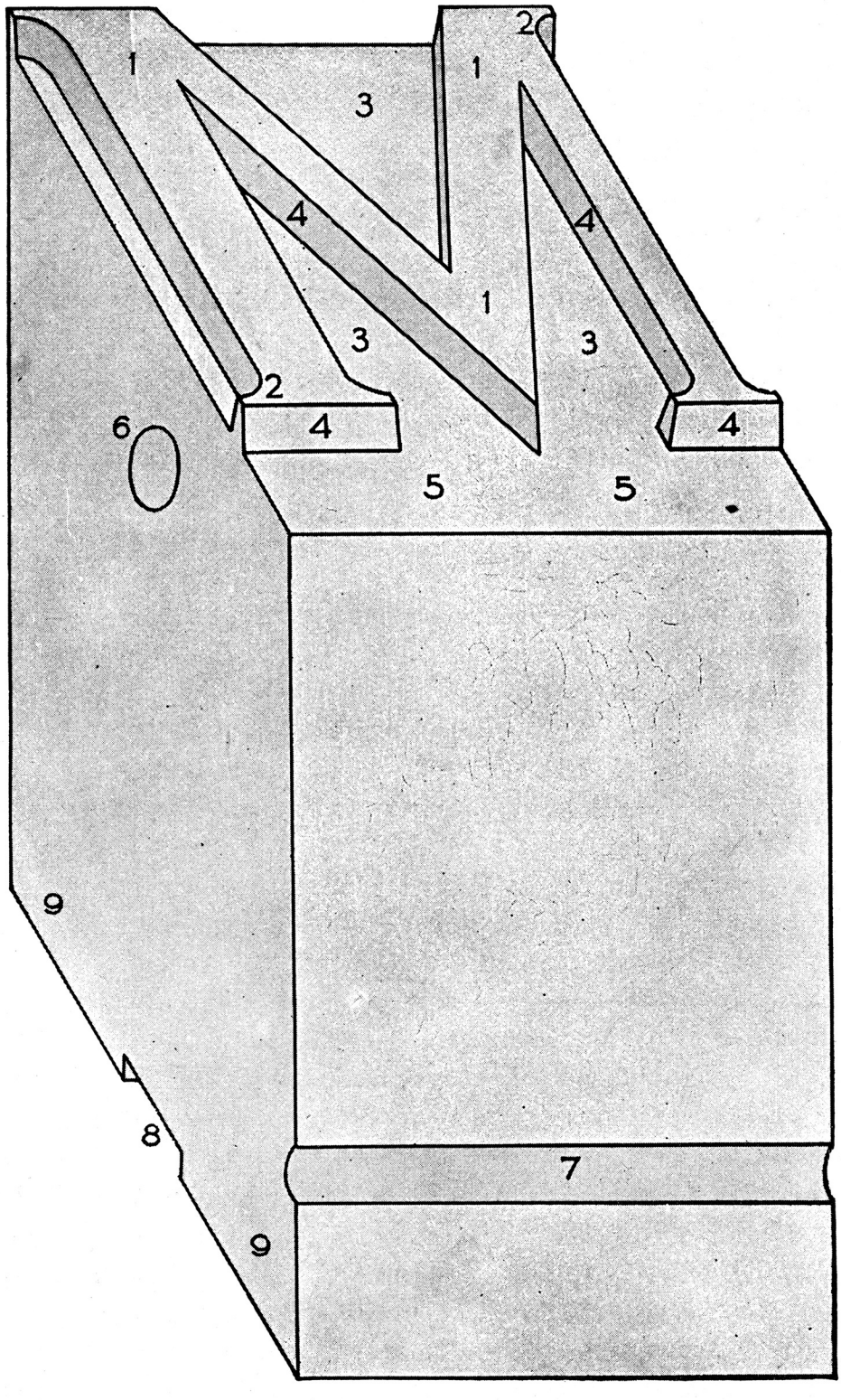


FIGURE 2

The different parts of a letter: 1—face; 2—serifs; 3—counter; 4—beard; 5—shoulder; 6—pin-mark; 7—nick; 8—groove; 9—feet.

The *feet* are found at the bottom and are the two parts on each side of the groove which support the type.

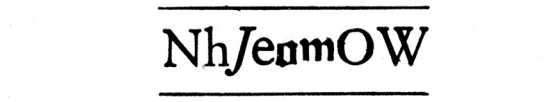
The *hairline* is the thinnest stroke of the letter. (Some types have no very thin strokes, and therefore no hairlines.)

Instruction: In order to thoroughly fix in your mind the different parts of a type, draw the large letter M (Figure 2) on a sheet of paper, in outline; first draw it in exact size, then somewhat smaller. Put the small numerals on the letter in proper position, and write a corresponding legend below the letter.

The Lining System

All American type founders are now casting type-faces on uniform lining systems, variously known as *American line, standard line, uniline,* etc. Certain classic faces of foreign origin are exceptions to the rule.

Before the standardization of the lining system, it was customary to



(a)

Showing irregularity of letter-position on type-body before adoption of lining system.

(b)

Showing relative amount of blank space or shoulder below letters. The line under the letters indicates the bottom of the type-body.

FIGURE 3

cast the characters of a font so that they would align at the bottom only with their mates of the same font, but not with any similar size of other fonts. When a compositor had occasion to use two or more different faces in the same line, these faces were rarely in exact alignment, but were either too high or too low, as shown in the accompanying example (Figure 3). It was therefore necessary to place thin leads, pieces of paper or cardboard above and below different parts of the type line in order to

get the faces in alignment. The modern lining system entirely eliminates this troublesome irregularity.

But even with the new lining system, the shoulder or blank space at the bottom and top of the letter increases gradually with the size of the type, so that a word of small type placed beside a larger size must have some spacing material below and above to keep it in proper alignment

(a)

An alignment of type-faces is obtained by using leads (1-point or 2-point) below and above the letters.

(b)

Here 2-point rules are used above the letters to line up the type-bodies. This causes an irregular line-up of the type-faces.

FIGURE 4

(Figure 4, *a* and *b*). This necessary difference in face-alignment of various sizes is graduated by points, and exact justification can therefore be made by using point-body leads.

There are, however, several type families which are not cast on the American lining system. The old Caslon, No. 471, and some of the old text-letters are among them. Faces having long descenders, like script types, must be high on the body, and will therefore not be in alignment with ordinary fonts of type.

Point-Set Types

In most of the modern type fonts the characters are cast a certain number of points (and sometimes fractional parts of points) wide. This produces type which is practically "self-spacing," because every type is placed on a body the width of which is equal to a multiple of a point. Mr. D. B. Updike, in his *Printing Types; Their History, Forms, and Use,* says: "In comparing fonts cast according to the old system of

irregular sets and those cast on the *point-set* system, we find the older font had more than ninety different sets, while the latter has but from thirteen to twenty. Something suffers when ninety different adjustments are reduced to from thirteen to twenty, and the 'something' that suffers is the effect of the type."

Monotype Fonts

In Monotype fonts the capital M is always the widest letter or character. In a 12-set face the M is 12 points wide, but it contains 18 so-called *units*. Other letters of the same font are smaller in proportion. Similarly, in a 10- or 9-set Monotype face, the capital M is 10 or 9 points wide, but it always has 18 units, which are, of course, thinner than 12-set units. The em of a 12-set font is 12 points square, but the em of a 12-point type would be 11 points wide if it were an 11-set face. In other words, letters on a 9-point body may have a 9-point set or an 8½-point set, and their corresponding ems would be 9 or 8½ points wide, as the case may be. In foundry type, the em is the square of any type-body—the 6-point em is 6 points square, the 7-point em is 7 points square, etc.; but in Monotype faces the em may be the same size as the body of the type or it may be narrower or wider. Monotype and foundry spaces and quads should not be used together in the same line for spacing or justification.

The following scale is recommended by the manufacturers of the Monotype machine in setting Caslon 337:

7-point on 8-point body	7¼	set
8-point on 9-point body	8	set
9-point on 10-point body	9	set
10-point on 11-point body	10	set
11-point on 12-point body	11	set
12-point on 14-point body	12	set

Due to their long descenders, it is necessary to cast the Caslon Oldstyle sizes on a body one point larger than the face.

The scale for other type-faces would, of course, vary slightly, to suit the design of the letter. Generally, the body-size and the point-size are the same.

Type Families

A type family consists of two or more series of one general type design. A slight variation is apparent in each series. The largest of the type families—the Cheltenham face—has twenty-three different series.

Every series of the Cheltenham family is cast in size from 6 to 72 points, and some of the series run up as high as 144 points in size. So

far as it is possible to obtain harmony among the variants of a type family this has been done in the Cheltenham family.

Type Fonts

A font of type consists of an assortment of characters of one body-size and design, in which the number of each character is proportioned according to the frequency of use in ordinary composition, the letter "e" being the most numerous, and the letter "z" the least. In the marks of punctuation the period and comma are present in equally large number, but smaller than the "e," and the bracket and parenthesis have the smallest proportion of any character in the font because they are least used.

There are, of course, fonts of different sizes. The job font is the smallest practicable assortment of body or display types. (See table shown in Figure 5.)

The weight font is an assortment of characters of one size weighing 20 pounds. A weight font of body type of a given size costs less per pound than a job font of the same size of type.

An ordinary font of roman type for book work will include these characters:

Roman Capitals—A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Small Capitals—A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Type founders sometimes make an extra nick on a few small capitals (o, s, v, w, x, z) in order to distinguish these types from the lower-case letters of the same font.

Lower-case letters—a b c d e f g h i j k l m n o p q r s t u v w x y z
Ligatures—fi ff fl ffi ffl
Figures—1 2 3 4 5 6 7 8 9 0
Fractions—⅛ ¼ ⅜ ½ ⅝ ¾ ⅞
Degrees and Minutes—° ′
Marks of Punctuation—, . : ; - ! ? ( ) [ ]
Dashes—En – Em —
Reference Marks—(old) * † ‡ § ‖ ¶ ☞; (new) 1 2 3 4 5 6 7 8 9
Diphthongs—Æ Œ æ œ æ œ
Commercial Signs $ & & £ @

Schemes of Job and Weight Fonts

Job fonts of 6-point type contain from 65 lower-case "a" and 33 capital "A" down to 26 lower case "a" and 14 capital "A," varying with the style and width of the letters. The 8-point font would contain a smaller

number of both letters, the 10-point font a still smaller number, and the ratio of number of letters decreases as the size of the body of the letters increases. A 72-point font may have only 3 lower-case "a" and 3 capital "A." A scheme of a 15-A 30-a job font is shown in Figure 5.

SCHEME FOR A 15-A 30-a JOB FONT OF 12-POINT*

CAPITALS		CAPITALS		LOWER-CASE		LOWER-CASE		POINTS	
A	15	R	15	f	12	w	12	!	6
B	6	S	15	g	12	x	6	?	8
C	10	T	15	h	20	y	12	(	6
D	8	U	8	i	30	z	6		
E	18	V	5	j	8	fi	3	FIGURES	
F	7	W	6	k	8	fl	3	1	5
G	7	X	3	l	20	ff	3	2	4
H	8	Y	6	m	16	ffi	2	3	4
I	15	Z	3	n	30	ffl	2	4	4
J	5	&	3	o	30			5	4
K	5			p	12	POINTS		6	4
L	10	LOWER-CASE		q	6	period	31	7	4
M	8	a	30	r	30	comma	31	8	4
N	15	b	15	s	30	colon	6	9	4
O	15	c	16	t	30	semi-colon	6	0	6
P	8	d	18	u	15	hyphen	9	$	4
Q	3	e	40	v	8	apostrophe	13	£	1

*Job fonts are usually put up by founders in two sections, one containing capitals, figures, and points; the other lower-case, with a small portion of points. Diphthongs Æ Œ æ œ are now not included in job fonts, and many advertising type fonts do not include the lower-case ligatures fi ff fl ffi ffl. Braces, dashes, and reference marks, as well as fractions, commercial signs, etc., are not now considered parts of ordinary fonts, but are put up in separate packages and must be specially ordered when wanted.

FIGURE 5

A font of type, which weighs about four pounds.

The wrappers which enclose the type when it comes in either job or weight fonts from the type founders usually contain all information regarding their contents. Although it is easy enough to understand what is meant by a 15-A 30-a job font, the apprentice is often at a loss to know what the 1/2, 2/2; 1/3, 2/3, 3/3; 1/4, 2/4, 3/4, 4/4; 1/5, 2/5, 3/5, 4/5, 5/5, etc., indicate. These fractions indicate that the particular font is made up of the first half and second half, or of the first third, second third, and third third. In other words, the numerator indicates that each package is one part of a complete font, while the denominator of the fraction signifies that the font is made up of as many parts as the figure of the denominator indicates. A twenty-pound font may be made up of five parts or packages, so the last package of the font bears the fraction 5/5. But a weight font may be put up in a larger number of packages.

Wood or Poster Type

Type for poster-printing is made of box-wood, maple, or other semi-hard wood, such as pine. The sizes of wood type are designated by line

rather than by point, a line being equal to one pica, or 1/6 of an inch. The smallest stock size of wood type is a 3-line letter or 3/6 of an inch, equal to a 36-point letter. Like the metal type, the smaller sizes of wood type run close together; namely, a 3-line, 4-, 5-, 6-, 7-, 8-, 10-, 12-, 15-, 20-, 25-, 30-, 35-, 40-, 50-, 60-, 75-, 100-, and 125-line. Larger sizes are usually known as half-sheet letters, 21 inches in height; one-sheet letters, 42 inches; two-sheet letters, 84 inches, etc. Wood type has no shoulder at the sides, bottom, or top of the letter, and therefore nearly always requires letter-spacing and line-spacing. Different letters call for different amounts of spacing. An A and a T, when set adjoining, call for very little or no spacing, an E and L call for a little spacing; an I and an H require a great deal of spacing. The work of spacing is generally entirely in the hands of the compositor, and he must, by eye measurement, decide the necessary amount of spacing material that is to be placed between the letters, and also between the lines.

Arabic and Roman Numerals

The different styles of numerals or figures used by the printer are shown in the table given herewith. Many oldstyle fonts furnished by the type founders have "ranging" or "lining" figures, which are shown in the first column of the table, under the heading of "Modern." From a purely artistic standpoint, oldstyle type is better accompanied by the use of non-ranging figures, those in which the 3, 4, 5, 7, and 9 descend below the base-line of the letter and the 6 and 8 ascend above the waist-line of the lower-case letters. All distinctly Modern fonts, however, have ranging figures.

In Roman notation of the present time, the six letters, I X L C D M or i x l c d m are employed. Various combinations of numbers may be built up with these letters by an additive or subtractive method. The I represents 1; II represents 2; III represents 3; V stands for 5; X for 10; L for 50; C for 100; D for 500; and M for 1000. In forming numerals, units of a higher order stand to the left of the one of lower order, thus MCMXXX stands for one thousand and—one thousand minus one hundred—and thirty, or 1930. When a letter of lower order stands before one of higher order, its value is subtracted, and thus IV reads 4; IX reads 9; XL reads 40; XC reads ninety. The Roman method of notation should be clearly understood by every compositor, because its use is frequent in many kinds of work. The earliest application of letters to indicate numbers was on stone inscriptions.

ARABIC NUMBERS				
Modern	*Oldstyle*	*Modern Italic*	*Oldstyle Italic*	ROMAN NUMBERS
1	1	*1*	*1*	I
2	2	*2*	*2*	II
3	3	*3*	*3*	III
4	4	*4*	*4*	IV
5	5	*5*	*5*	V
6	6	*6*	*6*	VI
7	7	*7*	*7*	VII
8	8	*8*	*8*	VIII
9	9	*9*	*9*	IX
10	10	*10*	*10*	X
11	11	*11*	*11*	XI
12	12	*12*	*12*	XII
13	13	*13*	*13*	XIII
14	14	*14*	*14*	XIV
15	15	*15*	*15*	XV
16	16	*16*	*16*	XVI
17	17	*17*	*17*	XVII
18	18	*18*	*18*	XVIII
19	19	*19*	*19*	XIX
20	20	*20*	*20*	XX
30	30	*30*	*30*	XXX
40	40	*40*	*40*	XL
50	50	*50*	*50*	L
60	60	*60*	*60*	LX
70	70	*70*	*70*	LXX
80	80	*80*	*80*	LXXX
90	90	*90*	*90*	XC
100	100	*100*	*100*	C
500	500	*500*	*500*	D
1000	1000	*1000*	*1000*	M

CHAPTER IX

COMPOSITION

The work of the compositor may be divided into two fundamental operations: The "setting" of type and the "unsetting" of type. The former is called *composition,* the latter is called *distribution.*

Composition is the act of transferring type from the case to the composing stick, in an orderly, systematic, and uniform manner, in such a way as to form words, lines, sentences, paragraphs, pages, or other desired divisions.

Distribution is the act of taking the types apart and putting them back into the case in such a manner that each character will be dropped, without injury, into its respective box, the spaces and quads into their places, and all other used materials into their receptacles.

Typesetting or hand composition is done today in practically the same manner as it was by the early printers, centuries ago. After the copy has been given to the compositor he should ascertain by reading the directions on the copy, or by asking the instructor or foreman, how wide the measure is to be, in what size of type it is to be set, the *indention* of paragraphs, and whether the lines are to be *solid* or *leaded.*

Use of the Composing Stick

If the composing stick that is to be used is adjustable, it should be made-up to the proper measure or width. Setting a stick depends upon the kind or style of stick at hand. If it has a graduated scale of picas and half-picas on its bed or bottom plate, it will be an easy matter to push the movable knee to the desired place and clamp it tight by means of the device provided therefor. Graduated sticks, like the Rouse sticks shown in Chapter V, are usually accurate and remain so while they are in good condition and are used as intended by the manufacturers. But it is a good idea to test even these sticks occasionally in order to ascertain if they have been tampered with. Testing may be done by securing some new labor-saving brass rules and placing several of them into the stick, or by using new 12- or 24-point foundry quads. (Monotype quads

should not be used, as they are not always of the same width as the quads which come from type founders.) If new quads are not available, 12-point letter m's, set sideways, with the nicks toward the right or the left side of the stick, can be used instead. A fractional part of a point should be allowed for compression or *squeeze,* by placing a thin piece of paper at one end of the stick between the letters and the sidepiece. For very short measures the piece of paper need not be used. For wide measures, 24-point m's should be used, as they will fill the line faster. All screw-clamp sticks should be set as described in this paragraph. The screw should not be loosened until all the lines of the job are completed, and under no circumstances should a wrench be applied to tighten the screw or clamp. It can be made tight enough with the fingers if the stick is in good condition. A brass rule or lead of the required length may be placed into the stick, because, being higher than the back of the stick, it will help to hold the types in position until the line is finished.

Learning the Lay of the Case

Before the student can set type he must know where to find it, that is, in which particular box of the case each letter is located. It is assumed that he has already seen and studied with more or less interest

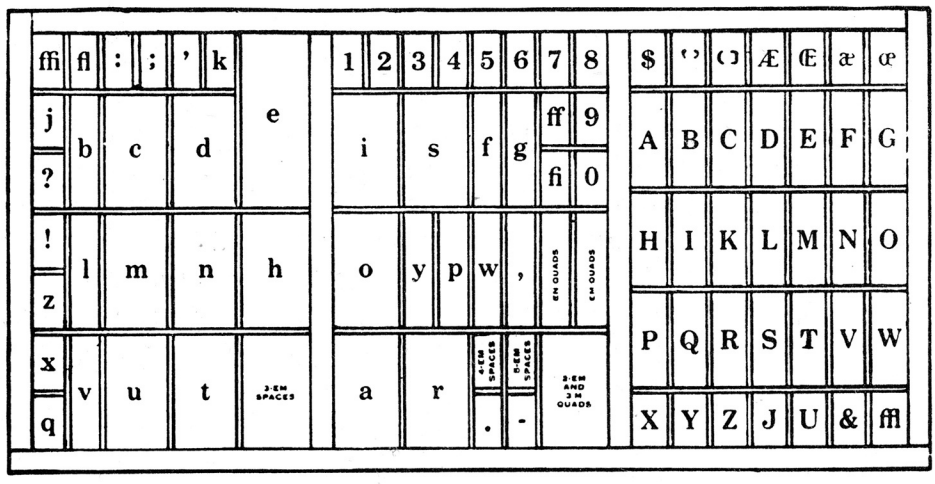


FIGURE 1

California job case—improved layout.

the plans of the type-cases shown in Chapter IV of this book; but not until he has fixed in his mind the location of each letter of the alphabet, including all other characters of the type font, can he hope to set type with any degree of speed or accuracy.

There are several methods by which the *lay of the case* may be

taught. There is a difference of opinion among teachers of printing as to which is the best method; the best method for one group of students may not be the best one for another group of students. The ages and the mental development of the students must always be considered.

In some schools the lay of the case is taught in the class-room by means of large charts, or by means of diagrams, and small pieces of cardboard on which are printed, in obverse and reverse, all the characters contained in the case, one piece for each character. The pieces of cardboard the student superposes at the proper place on the diagram, which has the characters printed in the various boxes. After a little practice, the printed diagram should be laid aside, and the student should try to draw a plan of the case, and on this plan write all the characters in their proper box or compartment. He should then compare his plan with the printed diagram. If any mistake has been made, the work should be corrected or done over.

In the printshop the lay of the case may be learned in various ways. Several good methods are here described. One method of learning the lay of the case is to draw a plan of it while standing alongside or in front of the case. After the outline of all the boxes has been made, the letters should be marked in their proper places.

Instruction: Begin by locating the lower-case a b c d e f g h i j k l m n (etc.). Repeat these letters several times, or until quite familiar with their location; next proceed with the remaining letters of the alphabet; then take the ligatures, fi, ff, ffi, fl, and ffl; and finally write the punctuation marks, figures, and spaces into the outline-drawing of the case. Examine the drawing carefully to verify the correct location of every character by comparison with the case. After a complete check-up, look at the case-plan for some time, pointing with the finger at the respective places that the letters occupy; and thus go through the entire font several times. Now lay the case-plan aside and try to locate the letters in the type-case without the aid of the plan. Read the letters in a vertical direction and also in a horizontal direction across the case. Repeat until the eye and finger can locate in fairly rapid succession, each character without referring to the case-plan.

Another method of learning the case is to use a blank diagram or chart showing the boxes of the case. This may save the time of drawing the case-plan, but it is not so good a scheme for memorizing the location of the letters as the one just described. Being compelled to draw the diagram with pencil and ruler has a tendency to fix the location of the boxes more firmly in the mind than can be done by simply taking a printed diagram and drawing the letters of the type-font in the boxes.

In a third method the beginner takes a printed diagram showing the boxes and the letters as they are in the type-case, and looks at this for some time, noting carefully where each letter is located. Then he goes to the case and picks up one letter at a time, beginning with the lower-case a, going through the entire font, and ending with the ampersand (&). The student then places the characters back in their proper boxes. After going through the entire case several times, the position of the boxes will be fixed in mind, and the diagram may be laid aside. Occasionally reference may be made to it during the first few days of the student's work.

A fourth method of learning the lay of the case (which is the method liked best by most students) is as follows:

Instruction: Stand squarely before the case, with the composing stick—adjusted to about 20-pica measure—and a few 2-point leads or 6-point slugs at hand. Pick up and set a line of lower-case **eeee

is another non-consecutive group, qxz; this group must also be fixed in the mind. When we come to the group lmnho, we say, "lmn over h to o." We now have only two groups remaining, and they are on the right-hand side of the case. They are fg and ypw. The location of the quads, spaces, numerals, and "points" is only a matter of a short time, and may be learned while the letter boxes are learned. The student will observe that by this plan, instead of learning the position of twenty-six separate boxes, he learns the positions of the following nine groups: ar, is, jk, bcde, lmnho, tuv, qxz, fg, ypw, which cover the twenty-six boxes. The capitals are learned in vertical groups: AHPX, BIQY, CKRZ, DLSJ, EMTU, FNV&, GOWffl; or they may be learned in alphabetical order.

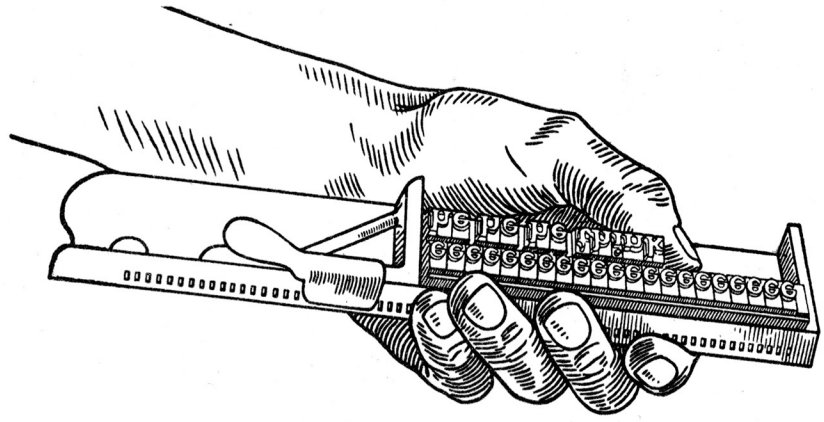


FIGURE 2

How to hold the composing stick while setting type.

Setting Type

The first requisite for good composition is a good composing stick; and a good stick is one in which the last line that is set can be justified exactly the same length as the first; a stick that is either set true to pica measures, or is capable of being so set, and that will remain rigid after being set. A compositor cannot do efficient work if the principal tool used by him is not perfect.

Instruction: Hold the composing stick in the left hand, slightly off center, so that it is held on the joints of the fingers, with the tips of the fingers just touching the lead or composing rule as it lies against the back of the stick. With the thumb and the forefinger of the right hand pick out the letters of the word to be set, and with a direct and steady motion place them in the left-hand corner of the composing stick. (Type must be set "right-handedly" even by persons who are left-handed.) The nicks of the letters should point outward or away from the compositor, but this does not apply to spaces and quads. They may be placed with the nicks away from or toward the compositor. (Many spaces and quads have no nicks.) The

thumb of the left hand should always rest on the last letter or space placed in the stick in order to prevent the letters from falling down or getting out of position. As the lines become filled with words, the thumb moves forward toward the head or right-hand side of the stick. As soon as the line is filled, and just before justifying it, read it over carefully and compare the type with the copy; correct any errors that you may have made.

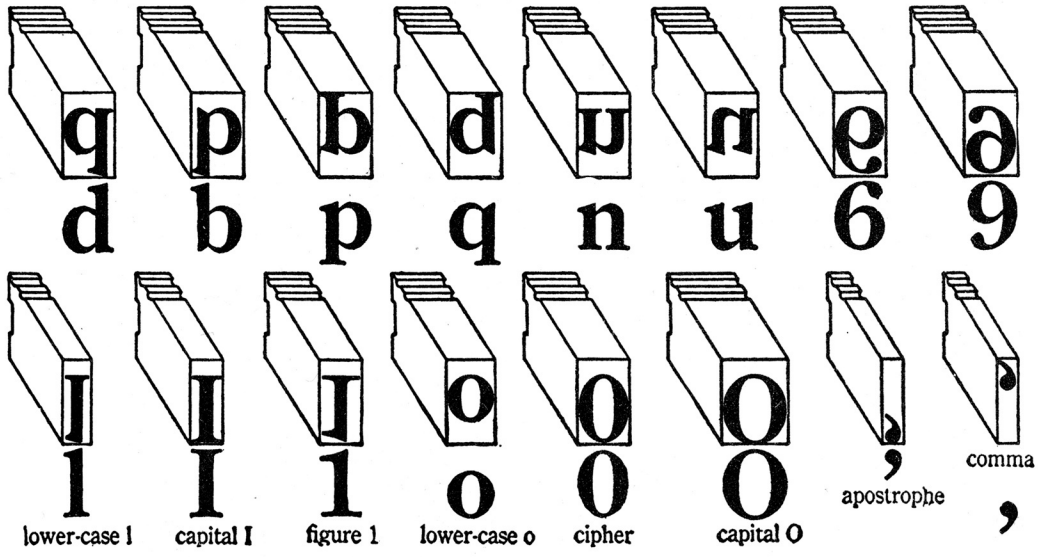


FIGURE 3

Characters which are difficult to tell apart. First and third lines—as they appear as types in the composing stick; second and fourth lines—as they print on the proof.

The Nick on the Type-Body

Every piece of foundry-cast type has one or more nicks near the bottom or foot of the type-body. These nicks are located in different positions in different sizes of the same type series. There may, however, be only a slight variation in the position of the nick in the same size of different type styles, but this variation is great enough to distinguish one font from the other.

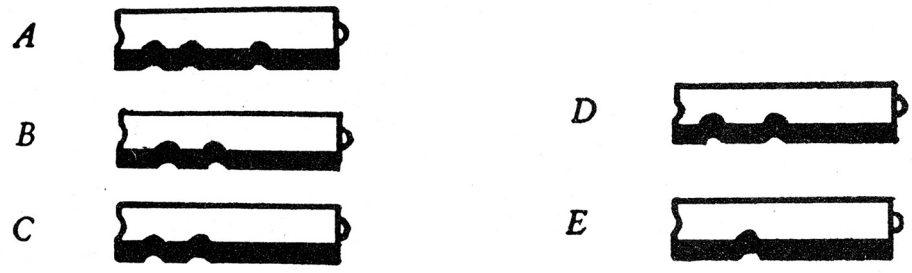


FIGURE 4

Five 12-point lower-case letters showing different combinations of nicks. *A*, Caslon Oldstyle; *B*, Caslon Openface; *C*, Goudy Oldstyle; *D*, Century Oldstyle; *E*, Cloister Oldstyle.

Instruction: In setting type the left hand, holding the stick, should always follow the right, which takes up the letters. If the left hand is kept stationary, considerable time is lost in bringing each letter to the stick, because the right hand has, consequently, to travel a much greater distance than is necessary. The eye should always precede the hand in seeking the next letter by locating the nick, which is near the bottom, while the fingers are picking up the one just selected. Each letter should be taken up by the upper end. This will prevent any false motion, and preclude the necessity of turning the letter while it travels from the box in the case to the composing stick. Always hold the stick with the open side slightly tilted so that the letters will lie against the back of the stick, composing rule or lead, if either of these is used. Place a lead after each line as soon as it is completed.

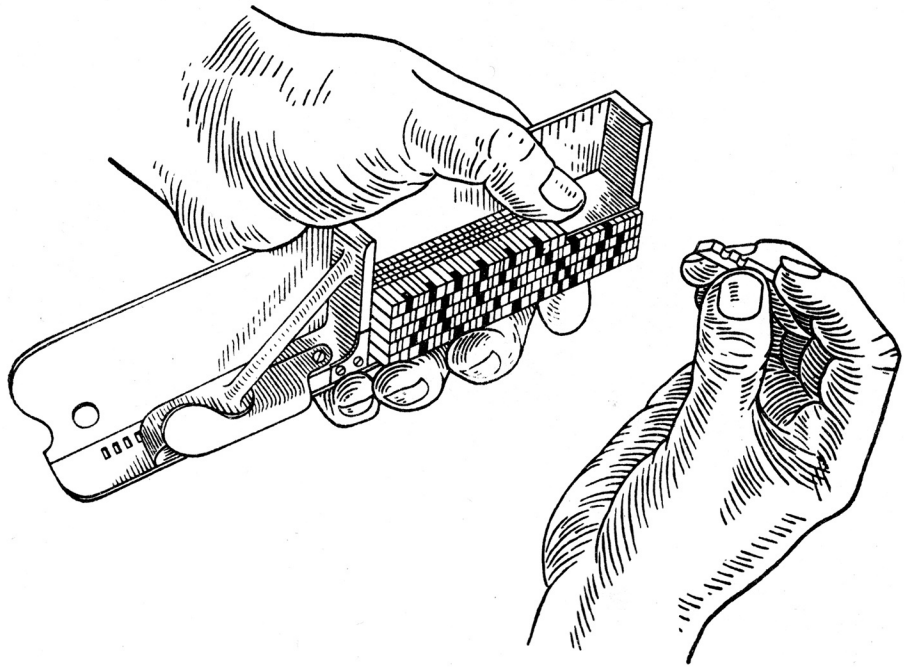


FIGURE 5
How to pick up the type and place it in the stick.

Spacing and Justifying

Spacing and justifying are the two most important factors in typesetting. *Spacing,* in typesetting, means producing white space between the words, but the spaces really serve the double purpose of providing this white space and of filling the line to the desired width. The act of making all lines of type in composition of uniform length is called *justification.*

If we set several lines of type of varying length together, and then attempt to lift them up by exerting pressure from both sides of the lines,

most of the pressure is brought to bear on the longest line, and very little on the shorter lines. When the type lines are not uniformly justified they cannot be *tied up* securely or *locked* in a chase.

After a line has been set it must be spaced out and justified to both ends of the stick. Typesetting is not like typewriting, in which all the left-over space is placed at the end of the line. The space must be divided equally between all the words in a line, and in addition this must be so done that the first word and the last word in the line will press against the sides of the stick; or, in other words, the line must exactly fill the stick from side to side. The effectiveness of *typography* depends largely upon the proper adjustment of space. In addition to the one-, two-, and three-em quads, the type case contains four different widths of spaces. Of these the three-to-an-em, or three-space (also called third-space), is the one most commonly used for setting straight matter which is solid or leaded.

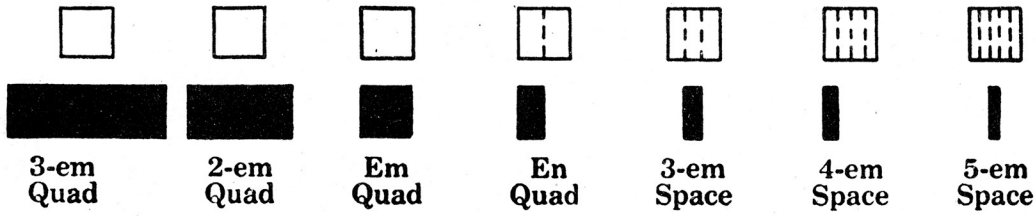


FIGURE 6

The different quads and spaces used in setting type. These are 14-point.

Instruction: In composing lines, begin the spacing by putting a three-space between the words. If these spaces will not fill the line, larger or smaller combinations of spaces must be used until exact justification is obtained. Read every line over as soon as it is set and correct errors that may have been made before spacing the line out and justifying it.

Testing Lines for Tightness

There are several ways of testing a line for tightness. By passing the fingers of the right hand back and forth from side to side over the line that has been justified, it will be easy to see whether or not the letters move; if they do, the line is not tight enough.

Care should be used that a type is not forced into a line so tightly that a thin film of metal is shaved from the adjoining type, the metal remaining under the feet of the letters and making them higher than the surrounding ones.

Another method of determining the tightness of a line is by lifting the line about three-eighths inch from the bed of the composing stick

with the thumbs and fingers of both hands. If the line will stay up when the fingers are released, it is tight enough; but if it will drop down onto the bed of the stick, it needs more justification. An observant compositor can also tell if his lines are spaced uniformly tight by pressing against the last letters at the sides. If they give, or contract even as much as a point, they are not right.

The apprentice-compositor frequently makes the mistake of justifying one line tight and leaving another loose, under the assumption that a line loosely justified can be made tight in the form by vigorous locking up. Theodore L. DeVinne, in *Correct Composition,* says:

"A line may be made apparently tight by strong locking up from the foot, but when the form is lifted from the stone a type may drop out unperceived, or it may be drawn out on the press by the suction of the rollers. This is a serious fault, for the absence of one character in the print may necessitate the reprinting of many sheets at a great loss. The compositor who does not justify lines firmly is rated as a careless workman, whatever his age or experience."

The three-to-an-em space is the blank usually put between words set in ordinary roman lower-case letters. This thickness is accepted as the average space that will give legibility to the work of a printed page held in the hand or at an equivalent distance from the eye. This gives the proper spacing in sizes of type from 8-point to 18-point. Smaller sizes of type may be spaced with the average of the en-quad; and for sizes larger than 18-point no definite rule can be given. The best average spacing between words depends to a large degree upon the design of the letter and the distance between the lines, but only enough space to make the words legible should be placed between them. The general rule to observe is that condensed or narrow faces may be thin-spaced, whereas expanded or wide letters should have the words correspondingly wide-spaced. Lines of capitals usually need wider spaces than lines of lower-case letters.

The last line of a paragraph should not be spaced wider than the average of the other lines. It is sometimes better to thin-space it in order to get in a short word or a single syllable that would otherwise stand alone in another line.

Uniform Spacing and Variable Spacing

Even spacing between all words in a line is desirable. A thin space on one side of a word and a thick space on the other side are inexcusable

faults. But where one sentence ends and another begins in the same line it is usual to separate them with a wider space—but not more than twice the thickness of the other spaces in the line. It is often necessary, in order to justify a line to the proper tightness, to add only a small space. This

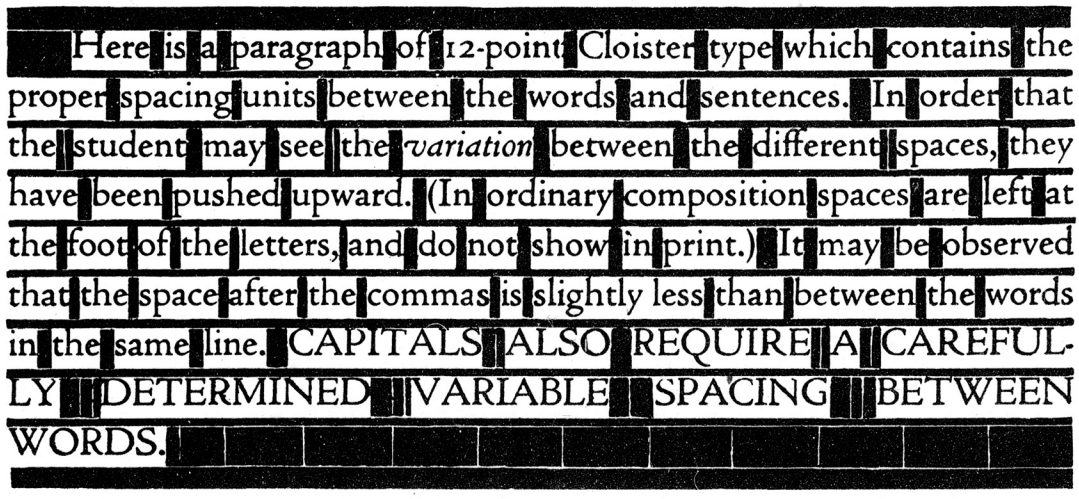


FIGURE 7

Words apparently spaced uniformly, but mathematically variable.

Here is a paragraph of 12-point Cloister type which contains the proper spacing units between the words and sentences. In order that the student may see the *variation* between the different spaces, they have been pushed upward. (In ordinary composition spaces are left at the foot of the letters, and do not show in print.) It may be observed that the space after the commas is slightly less than between the words in the same line. CAPITALS ALSO REQUIRE A CAREFULLY DETERMINED VARIABLE SPACING BETWEEN WORDS.

FIGURE 8

The paragraph shown in Figure 7, as it appears when printed. Compare the space-openings between the words.

should be done by putting a thicker space between the long words. Do not put thick spaces between short words and leave long words with thinner spaces. When it is necessary to reduce a few spaces in order to get a letter or syllable into the line, prefer to put the thinner spaces between the short words, or after a comma, or after y, w, v, or other small

letters which do not crowd upon the next word. A d at the end of a word and an h or l at the beginning of the next word may have slightly wider space than is used between words ending and beginning with small letters like a, c, o, i, v, u, y.

The lines in this paragraph are poorly spaced. Two 3-to-an-em spaces have been used between most of the words, and em quads between sentences. This produces "rivers of white" and causes the type mass to appear gray.

FIGURE 9

The lines in this paragraph are correctly spaced. A 3-to-an-em space has been used between most of the words, and en quads between sentences. This produces an appearance of compactness and uniformity of spacing.

FIGURE 10

In good book composition it is customary to place a thin-space (5-to-an-em or less) between the last letter of a word and such punctuation marks as the exclamation ! interrogation ? colon : semicolon ; and the left " and right " quotations whenever these points occur next to a letter with an upright or ascending stroke. These points should be followed by a wider space than is used between the other words in the line. Before and after letters like "A" "a" "C" "c" "O" "o" or letters followed by a comma or a period (which are set inside the quote-marks) or any type which has a slight space on its sides, the thin-space should not be used. No thin-space need be used when setting fonts of type in which all punctuation marks are on an en-set, because this gives them a slight side-shoulder.

The importance of attention to detail cannot be too strongly impressed upon the mind of the student at the beginning of his study of the trade and the art of printing. As he works as a learner, so he will work as a journeyman; if he is not a good student, he cannot be a good master—nay, he cannot be a master at all. Therefore, he should be careful, accurate, and neat in all his operations in setting type.

The best typographers of the present day—Updike, Rogers, Adler, Munder, and others—are spacing the lines of their pages very closely, 4-to-an-em and 5-to-an-em spaces being freely used. These printers use

> Two or more hyphens, commas, or other punctuation marks at the ends of succeeding lines of composition are displeasing to the eye, and should be avoided by close spacing of lines whenever possible.
>
> But it is better to divide words at the ends of two or more succeeding lines than make the spaces between the words so wide that *rivers of white* or *pigeon-holes* occur. Hyphens or other punctuation marks at the ends of the lines are less objectionable than excessively wide spacing.

FIGURE 11

In this illustration the upper paragraph is spaced better than the lower one.

no more space after the semicolon and period than they do between ordinary words in a line; and, of course, they always reduce the space after the comma.

INSPIRATION TO THE STUDENT

Printing is a great art, and in order to get the largest amount of pleasure out of your work, you must realize this. In printing we have not only the greatest of the minor arts, but also a very important trade; therefore you should never practice it as a trade alone. Be careful in the performance of all operations necessary to the execution of a job, from the beginning to the end. Then, when you take the final proof of your work, you may look upon it with pride and satisfaction.

It is desirable to have most of the punctuation marks within the lines (if possible), rather than at the ends. Two or more commas, semicolons, hyphens, or other punctuation marks at the ends of successive lines should be avoided, because they make the outer edge of the lines look irregular and uneven. It is frequently necessary to thin-space a line or two, in order to obviate objectionable divisions of words. Sometimes it is necessary to resort to wide-spacing when indivisible words come at the ends of lines. Certain lines may contain compound words and em

dashes. When these occur in the middle of the line the unsightliness of too wide spacing may be lessened by putting a thin space on each side of the hyphen that connects compound words, and a thin space (about a point) before and after the em dash as shown in these lines:

It is said that his great-grandfather was a second-cousin
—some biographers claim a first-cousin—of Edmund Burke

The Quotation Marks

Usually quotation marks are produced by using two inverted commas at the beginning of a quotation, and two apostrophes at the end. The practice of using inverted commas for "opening quotes" is, however, an undesirable makeshift, and is now being replaced by the use of proper opening quotation marks (") which are furnished by type founders. An examination of the two styles shown herewith will convince that inverted commas do not look well as quote-marks.

"This shows the proper marks."
"This shows the use of inverted commas."

Some fonts of type contain quotation marks in one piece. If there is a quotation within a quotation, single quotation marks must be used for the inner quotation. Should the double and single quotation marks come together, separate them with a thin space. In small sizes of body-type the quotation marks, if they occur at the beginning of a paragraph, are placed within the text, but in setting paragraphs of large-sized type, the quote-marks are frequently placed within the indention, so that the first letters of all paragraphs, either with quotes or without, line up, and are uniformly indented. The same rule applies to the setting of poetry, irrespective of the size of type.

A Useful Spacing Table

All compositors should be familiar with the different widths of space that can be made by the four ordinary type spaces and their combinations, from the 5-to-em to the width of the em. Between these two thicknesses there are twenty-three variations readily secured. Taking 60 as the *common denominator* of the five spacing units, and supposing that the em quad were cut into 60 slices, the em quad is 60/60ths, the en is 30/60ths, the 3-to-em is 20/60ths, the 4-to-em is 15/60ths, the 5-to-em is 12/60ths. Thus there are the following space combinations obtainable:

5-space	= 12-60ths	en and 4-space	= 45-60ths
4-space	= 15-60ths	3-, 4-, and 5-spaces	= 47-60ths
3-space	= 20-60ths	4 5-spaces	= 48-60ths
2 5-spaces	= 24-60ths	en and 3-space	= 50-60ths
4-space and 5-space	= 27-60ths	4-space and 3 5-spaces	= 51-60ths
en quad	= 30-60ths	2 3-spaces and 5-space	= 52-60ths
3-space and 5-space	= 32-60ths	en and 2 5-spaces	= 54-60ths
3-space and 4-space	= 35-60ths	2 3-spaces and 4-space	= 55-60ths
3 5-spaces	= 36-60ths	3-space and 3 5-spaces	= 56-60ths
4-space and 2 5-spaces	= 39-60ths	en, 4-, and 5-spaces	= 57-60ths
2 3-spaces	= 40-60ths	3-space, 4-space and 2 5-spaces	= 59-60ths
en and 5-space	= 42-60ths	em	= 60-60ths
3-space and 2 5-spaces	= 44-60ths		

The small diagrams here shown may aid in giving a clear explanation of the unit spacing system. Although a 72-point em is used in the illustrations, the spacing table and system is applicable to any size of spaces and quads.

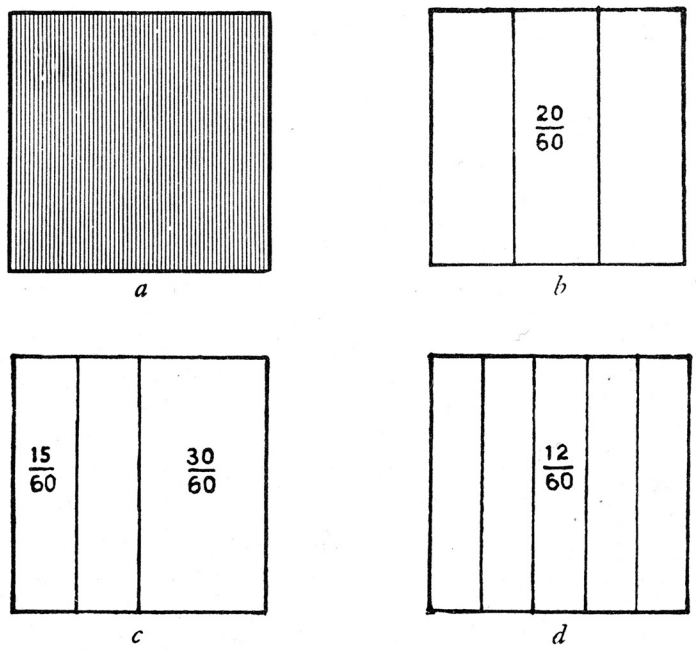


FIGURE 12

a, a 72-point em, divided into sixty slices or units (not points); *b*, the same em, divided into thirds, each part having a value of 20 units; *c*, the em, divided into two fourths and one half; two 15-unit pieces and one 30-unit piece; *d*, the em, divided into fifths, each piece having a value of 12 units.

Speed in the Spacing of Type

Good spacing should be a matter of pride with every compositor. It is not difficult to acquire the habit of evenly and rapidly spacing out a

line if a practical system is employed. With some study and practice, the omitting of useless motions will in a short time become second nature —not only will the compositor's work be done correctly, but his output will be greatly increased by making it unnecessary to go over the matter again to revise bad spacing and other errors.

Instruction: When all the words and syllables which will come into the line have been put in place, the first thing to note is the amount of space still to be put in to justify the line, and convert this space into units, which are relative space-sizes. Count the number of openings between the words in the line (which are usually one less than the number of words) and allot an equal number of units to each opening. If there are a large number of words, it may not be possible to insert—in addition to the spaces already there—even the space having the smallest number of units (the 5-to-an-em) in each opening between words. If that is the case, add the space units which are already between the words to those necessary to justify at the end of the line, and then divide the total number of units obtained by the number of openings between the words. The result will generally be one of the combinations shown in the spacing table. If two different combinations must be used, place the larger combination of units between words having tall letters at the beginning or end (like *had been, all homes*). If any spaces are to be left thinner than others, leave these between words beginning or ending with small letters (*they were, under orders*), or after the commas.

Instruction: To illustrate the use of the unit spacing table still further, we will assume that a line set in 10-point type contains six words; between the words there are 3-to-an-em spaces. The line lacks one em (60 units) of being justified. *Which space should be placed in the five openings between the words?* A 5-to-an-em space, in addition to the 3-to-an-em spaces which are already there.

But if the line lacks 50 units (a half-em and a 3-space) of being filled or justified, *how much should be put between words?* Adding the spaces together which are already in the line, we get 100 units; plus the 50 units which the line lacks of being justified, makes 150 units; this divided by five openings, equals 30 units. Solve by taking out the 3-to-an-em spaces and inserting en-spaces instead.

A unit is not the same as a point, and can be used with equal facility in justifying all type-sizes. In another line, set in 12-point type, and spaced with 3-to-an-em spaces, we have seven words; there are 27 units necessary for justification. Six openings—$27 \div 6 = 4\frac{1}{2}$ units. Put 24 units in five openings and 27 in the sixth by using two 5-to-an-em spaces between six words and a 5-space and a 4-space in the remaining opening.

Use and Misuse of Copper and Brass Spaces

It is a serious mistake to allow beginners to use copper or brass thin spaces for justifying lines. These are properly used for *interspacing* of

words in display composition, and for variable spacing in words of capitals in fine work, but they are not required in setting body type of 6-, 8-, 10-, 12-, or 14-point size, when set in normal measure. The student-printer should learn to justify his lines by using the twenty-five different space combinations shown in the spacing table on page 143 of this book. These are formed with the ordinary spaces supplied with every case of body type.

Spacing for Narrow or Wide Columns

Type matter to be *made up* in pages of two or more columns should not be wide-spaced, even if it is leaded. Composition of this kind is usually in narrow measures. When the columns are made up with no separating rules, wide-spaced words in adjoining columns would be closer together than words within the same line. If the lines are wide-leaded also this makes it difficult for the eye to keep the proper sequence of words from line to line and confuses the words of two columns. The practice of thin-spacing type set in narrow measure will prevent this fault.

In deliberate work, such as magazines, catalogs, and advertising pamphlets, the relation of the spacing of the lines and of the separation of the columns should be carefully considered.

In broad measures of double-column matter the blank space between the columns may be wider than for narrow measures of the same type style, and consequently the average spacing of the words would be wider. The en quad may be the average space in wide measures of leaded composition, especially for the smaller sizes of type.

Spacing of Italic Type

Lines of italic type are more difficult to space than the same lines when set in roman type. Usually the space between words may be about the same as that employed for the companion face of roman; but more frequently than in roman type, because of the kerns on the letters, the spaces in a line need to be of unequal thickness in order to give a uniform appearance to the spacing. Overhanging letters are more frequent in italic than in roman, and when these come at the beginning or end of words they require a little more space than is used for words ending or beginning with small letters.

In composing italic type, the kerns of certain letters—noticeably in sizes above 12-point—overlap the shoulders of adjoining letters. If any

kerned letters, like f, j, l, p, x, etc., happen to stand at the beginning or at the end of a line, a space, of the exact width of the overhanging kern, must be placed alongside of the letter, which indents or "throws in" the type-body of the kerned letter so that the type-face will be "flush" with the first and last letters of the preceding or following lines. If spaces are not placed under the kerns, they are likely to break off in taking proofs or in printing the composition.

Italic type is never selected now as the type for the text of a book, but it may be used with good effect for the preface. Italic is suitably used for subheadings, and is well adapted for names of actors or persons in plays, for titles of books, and for many special words which require no great emphasis, but which should be discerned at a glance.

Paragraph Indentions

The distance which the first line of a paragraph is pushed in from the succeeding ones is called the *indention*. The rules for indention vary slightly in different shops; the ones given below should not be regarded as the only correct rules.

The indention of the paragraph depends upon the width of the measure. The wider the measure, the more the paragraph should be indented. A large-point type should be indented more than a small-point type, no matter what the width of measure may be.

An em quad should be used for indention of paragraphs set 20 picas wide or less, and an em and a half from 21 to 25 picas. Between 26 and 30 picas a 2-em quad should be used. Above 31 picas a 3-em quad should be used for indention of paragraphs.

A paragraph should not end with a line containing only one syllable of a word. The isolated appearance of a word or a syllable on a line (unless the line is set in narrow measure in 6-point type or smaller) is not pleasing. A paragraph should not end closer than an em quad from the end of the line. If the space remaining in a line at the end of a paragraph is less than an em this space should be divided equally between all the words in the line, and the line spaced out full. Whenever possible, the paragraph should end somewhere near the middle of the line.

In some of the early printed books the paragraphs had large indentions to allow putting in of paragraph marks by hand afterward. In some instances the paragraph marks were not filled in, and it was thus discovered that the eye could pick out the beginnings of paragraphs indicated by blanks almost as easily as those having paragraph marks.

In modern days paragraphs are not always indented, but extra leads are put before the first line and after the last line of an unindented paragraph.

There are, in composition, in addition to the kinds of paragraph indention already mentioned, other recognized styles, four of which are shown below.

Hanging Indention is the term applied to a style of indention shown in this paragraph. *Flush and hang two ems* is a common way to designate it in some printshops. The first line is set full measure, and the succeeding ones are indented two ems on the left.

Here is another style of **hanging indention.** In this style the first line is set full length, and the succeeding lines indented one or two ems on each side. *Flush and hang one em on the left and right.*

Half-diamond or **inverted pyramid indention** is that style in which the first line is set flush to the left and to the right of the stick, and the succeeding lines are indented on both sides so as to decrease their width gradually, the last line containing but a few words of text

In **diagonal indention** the words are so arranged that two or more lines follow each other diagonally as shown here.

Emptying the Stick

The beginner at composition should not fill his stick entirely full before emptying it. After setting four or five lines, they should be lifted out and placed on a galley. One of the most difficult tasks of the young compositor is that of transferring the composed lines from the stick to their proper place at the upper left-hand corner of the galley. Before attempting this, the apprentice should practice with a dozen or more leads or slugs.

Instruction: Put the leads or slugs into the stick and take them out as though they had type lines between them. Do this several times in order to train the fingers in the necessary movements. When you finally essay to take the type lines from the stick you will be able to lift the entire mass in a solid body, and place it squarely and vertically on the galley. If the lines are allowed to slant either backward or sidewise, the types will not be squarely on their feet, making it difficult to stand accurately in order that they may be tied up securely before taking them to the proof press.

Instruction: One method employed in emptying the stick is to place the stick on an empty galley near the open end, with the top line or back of the stick at the lower rim or side of the galley. The two forefingers are then placed against the last line and the two thumbs against the top line. (See

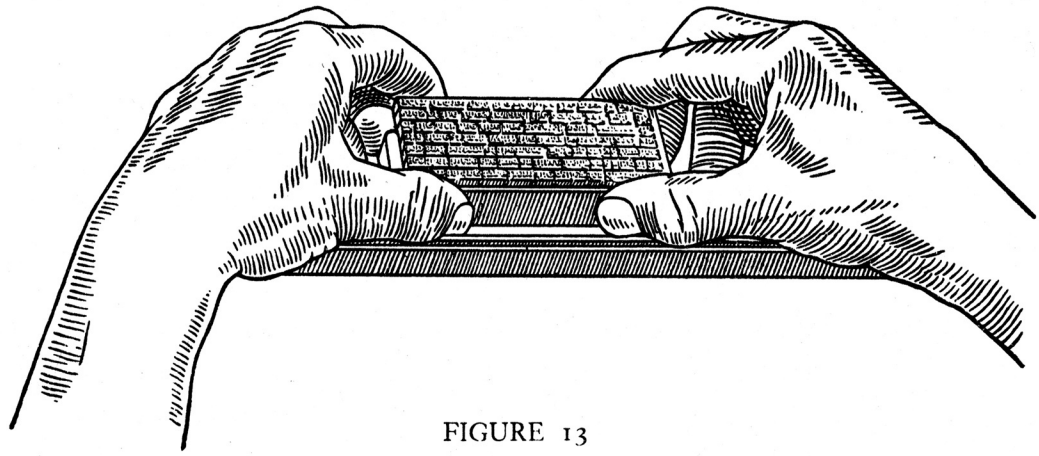


FIGURE 13

Pushing the type out of the composing stick onto the galley.

Figure 13.) The second fingers, doubled up, are pressed against the ends of the line at both sides. While thus gripping the lines, they should be held with an even pressure from all sides. Lift the top lines slightly with a turning motion in order to bring the feet of the type off the bed of the stick. This gives a chance for the thumbs to secure a firm hold down beside the top line. The small fingers are used to press against the outer rim of the stick, thereby holding it down while the lines are being taken out. As the type slides out of the stick, bring it into a horizontal position, while turning your right side toward the galley. Holding the type in a horizontal position reduces the danger of having the letters at the ends of the lines fall off. If, however, a letter should drop off, do not attempt to stop it, but keep on holding the lines firmly until they are brought down on the galley and pushed into the lower corner against the left or lower rim; from here they are shoved, along the rim, into the upper corner. Do not release your finger hold on the type until this is done. Keep the middle fingers against the sides of the type until it is safe in its place on the galley.

Frequently, the beginner will disarrange the lines slightly while transferring them from the stick to the galley, so that they will be *off*

their feet, that is, leaning toward either the right or the left side; not standing exactly vertical. If this occurs, the lines must be straightened up before they are tied with a cord. The straightening up can be done with a make-up rule, or a piece of metal or wood furniture. By pressing the make-up rule against the right side of the lines (the left side rests against the lower rim of the galley), and placing the fingers of the left hand against the type that is leaning against the rim, the types can easily be brought to stand in an upright position.

If the compositor uses a graduated stick on which the movable knee is easily unlocked, another method may be used for emptying the stick.

Instruction: Place the stick on the galley at the open end and unlock the clamp of the knee; then grip the lines as explained in the first method, and slide them out of the stick onto the galley without lifting them off the bed of the composing stick. Without releasing the hold on the type lines, slide them into their proper place against the rim of the galley in the upper corner. The composing stick in the meanwhile may slide off the galley onto the case or stand. Do not try to prevent this, as the transferring of the type to the galley will require all your attention.

Tying Up the Type

After the type has been removed from the stick, the next step is to fasten it securely so that it can be handled in the proof press without danger of *pi-ing*. The most common practice is that of tying it with page cord. There are other devices, such as galley locks, but these will not be discussed here.

Instruction: In tying a type job or page, take a piece of strong cotton cord and tie a knot at both ends; this will prevent it from unraveling, and will help to fasten it securely while being wound. The cord should be long enough so that it may be wound at least four times around the type-mass if that is small, say 4 inches square. With any increase of the size of the type-mass, the length of the cord should also be increased, so that large jobs covering 6, 8, 10, or 12 square inches may have as many as six, eight, ten, or twelve windings of cord around them. Begin to fasten the cord at the left top corner of the matter as it rests on the galley—that is, usually at the end of the last line. (See Figure 14.) With the left hand hold about three or four inches of the cord, while the right hand winds the longer section along the upper side, around the head, and down the lower side of the matter, close to the rim of the galley, and then back to the starting point. Here cross the cord over the first end so as to bind it, each turn of the cord at this point going above (or below) the preceding one. Pull the cord tight at each corner. At the other end, or near the end, of the cord turn in a loop just around the corner, at the head, pushing the cord between the types and the windings

with the nib-end of the composing rule, or with the make-up rule. Do not use leads for pushing down the string. This is bad practice in shops where leads must be used over and over. Pushing down the end of the cord with leads is likely to bend the leads, thus making them unfit for further use as spacing material. Draw the loop up fairly tight so that it will not become un-

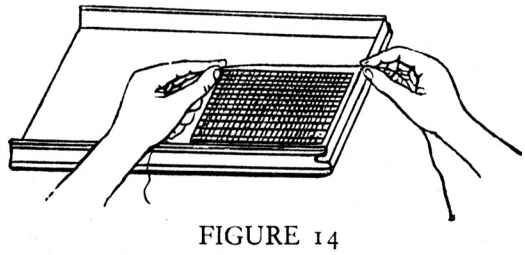


FIGURE 14

How to wind the cord around the type-mass on the galley.

fastened, and leave a short end out, to be found later when necessary to take the cord off. Do not tie the two ends of the string together in a knot, as this may cause trouble when the cord is to be taken off.

A good rule to pursue in tying type is always to stop at the upper right-hand side or top of the page, leaving about three inches of the cord overlapping. If the cord is always pushed in above the first line of type, everyone will know where to look for the end of the cord when the job is to be untied. (See Figure 15.) To follow this suggestion may frequently necessitate cutting or breaking the cord when the top is reached. In some shops a small pair of scissors is given to each compositor, which he keeps in his apron.

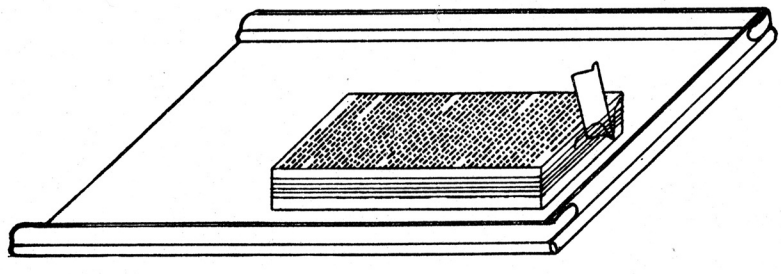


FIGURE 15

Fastening the end of the cord at the upper end of the type-mass.

Instruction: Hold the left hand on the page until the end of the cord is made fast, to avoid any unexpected movement of the page during the operation. When the page is fastened, move it away from the lower rim of the galley and push the cord down to the middle of the type-height, especially if low leads, spaces, and quads are used in the matter. If the cord is left above the center from top to bottom there is a possibility of the page's doubling up when it is picked up or pushed off the galley to the imposing stone. It is a good idea for each student to have four or five pieces of page cord of varying length, ranging from three to seven feet. As these can be

used over and over again, the student should keep them in an orderly manner in a convenient place in his apron pocket or on his workstand.

The tendency of the day, in many commercial shops, is to use the cord but once, and to provide a small ball of light inexpensive cotton cord, together with a pair of scissors for each man who has any tying up to do. Instead of untying the job in the old way, the compositor takes his scissors and cuts the cord; if the job is a small one, he pulls the cord off at one corner and throws it away. This is said to effect a saving of time the value of which greatly outweighs the value of the cord thrown away after use.

Taking the Proof

Taking or *pulling* a proof is a procedure that is always watched with a great deal of interest by the beginner at composition, especially if he is unfamiliar with the process. He is curious to see how his work looks when it appears in ink on paper. Usually the proof is taken on a proof press, various styles of which are described in Chapter VI.

Instruction: It is important that the mechanism of the proof press shall be well understood. Ask someone to explain it to you. The roller or cylinder which produces the impression should be properly *packed*. Too much packing will cause the type to punch through the paper or show on the back of the sheet; this will injure the type. Too little packing will cause a faint or light proof; the latter defect may be remedied by placing a thin sheet of paper under the galley. A great deal of damage can be done to the type if the proofs are not taken in the proper way.

Instruction: Place the galley with type as nearly as possible in the center of the bed of the press, in order to get a uniform impression. Spread the ink thinly over the type with the ink-roller or *brayer;* do not press the roller down on the type, nor rub it over the mass. The roller should *roll* over the form gently, once or several times in both directions. Place the proof paper on the type as steadily as possible, and do not move it after it has touched the inked surface of the type. The slightest movement will produce a *slurred* impression. After the roller or cylinder of the press has passed over the paper and type form, and the impression on the paper has been made, lift the paper off the type gently and slowly; do not "rip" it off quickly, as this may cause a smeared appearance of the proof or *pick* off the surface of the paper if the ink is stiff and the paper has a smooth coated surface.

Do not take proofs of type while it is in the composing stick; this may injure the type and stick also, and it may even damage the *tympan* of the proof press.

Be careful not to "pull" out any type with the roller while inking the form. If the ink is too "tacky" or stiff, or the type-mass is not tied tightly

enough, or the lines are not justified properly, some of the letters will stick to the roller and pull up. Such letters are likely to be injured when the proof is taken. See that all letters are on their feet before placing the proof paper on the type.

When it becomes necessary to take proofs of single letters or lines of type standing alone, it is advisable to place *guard lines*—which are labor-saving metal strips of 18- or 24-point width that are used for locking up foundry forms—around the matter to be proved. This will prevent the roller or cylinder of the proof press from bearing down too heavily on the type. Small fine-rule boxes must be proved in the same manner if good proofs are desired.

Usually two proofs are taken when the galley goes to the press the first time. One proof is given to the proofreader, who reads it and places his marks in the margins and returns it to the compositor. The other proof is put on file to be used for measurement.

During the early days of printing proof presses and metal galleys were unknown. The type was set up, made up into pages, *imposed* and locked in a *chase* before it was read. After the form was locked up it was proved on the hand press, the proof was read, and the type was corrected on the imposing stone. Perhaps few *revises* were taken, but whenever a revise was necessary, the form had to be put back on the press, which press also printed the sheets for the book.

Cleaning or Washing the Type

After proofs are taken, the type must be cleaned; that is, the ink must be removed from its surface. Benzine and gasoline are the most common cleaning fluids for type and printing plates.

Instruction: Apply the gasoline to the surface of the type by means of a soft rag, rolled into the shape of a pad. Or, if a so-called *cotton wiper* is used, pour a little gasoline on the wiper. Generally a few drops will be sufficient. Pass the moistened rag several times over the type, until all the ink has been removed and the surface looks clean and bright. If too much gasoline is put on the wiper (or on the type), the ink, dissolved partially, and the excess gasoline will run down over the shoulder of the types and in between the lines, making them sticky and dirty. When the type is again inked, for the next proof, the remaining gasoline, which has not had time to evaporate, will mix with the ink, causing a gray, indistinct, and mottled proof. If you pour the gasoline direct onto the type, you will not be able to take a good, sharp proof after the errors have been corrected. It is best to have two pieces of rags or cloth at the proof press, one for applying the gasoline, the other, a

clean, dry rag, for going over the type after the gasoline-rag has removed the ink. The dry and clean rag thereby takes over any surplus oil that may remain while the ink is being rubbed off. The inky rag should be turned from time to time to bring out a clean surface. When the gasoline-rag becomes badly soiled with ink, it must be replaced with a clean one.

Kerosene should not be used for washing type, as it is too heavy an oil, and leaves a disagreeable greasy surface on the type, which evaporates much more slowly than gasoline or benzine. For this reason it is not satisfactory for removing ink from printing forms. It is, however, a good washing fluid for inking rollers.

A small type-brush is useful to aid in cleaning type of which proofs have been taken. This should be used after the ink has been wiped off the surface of the type with a rag that has been moistened with gasoline. Brushing the type-mass will remove any ink or dirt that has collected below the surface, on leads and slugs, and between the letters.

Instruction: Do not apply the cleaning fluid with a brush. The brush may remove the ink from the surface, but it does not carry it off entirely. It often leaves the ink and the oil in the hollow parts of the composition and around the shoulder and counter of the types where the fluid has washed it.

The brayer or hand roller used for inking the type and the ink plate should be cleaned every day. The soiled rags may be used for this purpose.

A solution of lye, made from dissolved potash, was formerly used extensively for washing type forms and rollers, but its use has been superseded by benzine, gasoline, and kerosene. Lye is, however, an excellent substance for washing type occasionally, as after a long run on the press or after electrotype molding, to clean off the accumulation of dried ink or of molders' wax and black-lead or graphite.

When lye is used for cleaning purposes, the type form should be stripped of all wooden furniture, reglets, plates, brass rules, and anything that is likely to be injured by the lye. The type should then be placed on a board, or on a wood or zinc galley, and set into the sink. The washing is done with a small hand-brush, care being taken not to allow the hands to get wet with the lye, because the solution, if strong, will burn and discolor the skin. After a thorough but not hard rubbing, the lye is rinsed off with running hot or cold water until all traces of it have disappeared. Caustic soda may be dissolved to the proper strength and used in the same manner as potash lye.

Some electrotypers wash the type with lye after a wax mold has been made of it, but they do not entirely remove the lye in rinsing. When the type is returned to the printer, he finds that it is caked together and is covered with a whitish powder, which is the residue of the lye—sodium hydroxide. This may also happen in the printshop when washing is not done properly. If type is in this condition, it cannot be distributed easily. The best way to loosen the types without injuring them is to put the matter on a brass or zinc galley and place it in a pan of very hot water for an hour, changing the water several times; or by letting the hot water run over the type for some time. This will separate the letters, so that they may be distributed in the usual way. It is, of course, advisable to dry the type partly after taking it from the water, before distributing, by setting the galley on a radiator for a short time.

In mixing the washing solution, care should be used to follow directions which the manufacturer gives for use of lye or caustic soda. If the solution is made too strong it is likely to injure the type-mass. Halftones, line-engravings, wood blocks, or linoleum blocks should not be washed with lye or caustic soda.

Correcting the Proof-Errors

After the type has been washed so that it presents a clean face, it is taken back to the case in order to make the corrections which the proofreader has marked.

Instruction: Untie the type by winding the cord around the fingers in a skein, so that it may easily be used again after the corrections in the metal have been made, and put it in a convenient place on the workstand.

If the letters or points to be corrected are of the same thickness as those that are to be substituted, the lines need not be removed to the composing stick. With the right hand take from the case the new letter to be inserted, while the left hand pulls out the old letter, turning it slightly forward to permit slipping the new one into the opening made by the removal of the old one. Put all letters and spaces taken out of lines back into the case at once; do not throw them indiscriminately on the stand.

If, however, letters to be changed are not of the same thickness—and this is very often the case—each line containing errors must be placed into the composing stick, the errors corrected, the line accurately respaced and justified, and then put back into the galley, after which the next line in order should be taken up and corrected in the same manner.

Sometimes it is necessary to overrun a few words or lines in order

to correct a bad division, a *doublet* or an *out, see copy*. In this case it is best to moisten the type with gasoline so it will stick together. Then, after putting into the composing stick the first line that is to be changed, the other lines that are to be overrun are set out the long way against the rim of another galley, with the beginnings of the lines toward the foot of the galley. One or two leads, of the same length as the lines, should be placed at the top and bottom of each line as it is taken away from the paragraph. It is then an easy matter to take off a few words at a time from the beginning of the line and reassemble them in proper

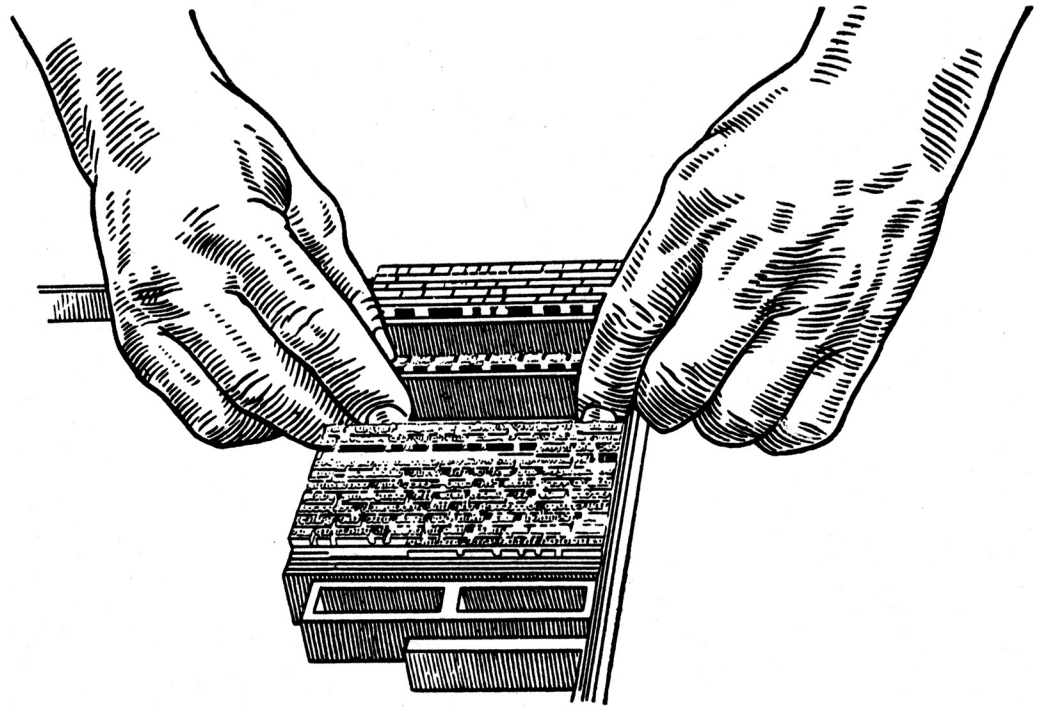


FIGURE 16

Taking a line from the galley, to be placed into the composing stick for correction.

order in the stick. Each line must, of course, be carefully respaced and justified. It is easier and quicker to overrun lines in this manner than to put down the stick and take up each word separately and transfer it to the stick.

In rejustifying paragraphs to make their measure wider or narrower than they originally were set, a similar procedure should be followed. If gasoline is used to moisten the type-mass, whole lines may be picked up easily without danger of pi-ing them.

If type that is set solid—without leads between the lines—requires correcting, leads of the proper length should be temporarily inserted. This will make the correcting easier and prevent the type from pi-ing.

Instruction: Do not use *tweezers* or *bodkins,* as these will frequently injure the face of the letters. Make all ordinary corrections with the fingers. The fingers can be trained so that they can pick out the letters with great facility, and much faster than tweezers. Hold the stick in the left hand while respacing the lines. Do not place the stick on the stand and attempt to pull out letters or spaces; remove the last lead and the last letter in the line in order to loosen it, and then proceed with the correction. Unless the character or letter is the same as the one that is to be replaced, it is usually impossible to space the line accurately if it is not placed in the stick. The line may seem to be of the same length, but when it is brought to the stone to be locked up, a slight difference is noticeable and the job will not lift. This will cause an unnecessary loss of time, as the form cannot be sent to the press until it is properly justified and locked up. Learn to do the correcting in the right way.

Instruction: After all corrections have been made, the type is generally placed on racks or in galley cabinets before it is locked up for the press. Be careful when sliding galleys into a galley cabinet or rack. It is not unusual to have type and engravings damaged by either lowering or raising the head of the galley when sliding it into the rack, thus allowing the type to rub against the slide (which is made of metal) above. Don't slam the galley in; if you do, you may pi the type at the foot of the galley.

Correcting Linotype Matter

One of the duties of the apprentice in the printshop may be the correcting of long galleys of machine composition. The essential difference between correcting errors in galleys of foundry or Monotype, and of slug-line matter, is that the latter requires the changing of an entire line wherever an error is marked in the proof. In correcting the proof-errors for Linotype matter, the operator resets every line which contains an error. These new lines must be substituted for those in the galley. The work of correcting is not so easy as it would appear. Linotype slugs are difficult to read, and, at a glance, they look very much alike. Care must be used that the right line is put in the right place in the galley and that the line containing the error is taken out. In case of a run-over, several lines may have to be taken out or inserted, which may increase or decrease the number of lines on the galley. The corrector should see to it that no lines are turned upside down in making corrections.

How to Clean Halftones

Every printer should be careful when cleaning a form containing halftones not to use a wiping rag that holds pins, buttons, hooks, etc.

It is best to select only clean, white rags for cleaning purposes, and each rag should be examined for pins, buttons, and other "plate-scratchers" before it is used to wipe off ink.

When taking proofs of forms containing halftones, it is advisable to clean the form with a soft brush and benzine or gasoline. A brush having extremely coarse hairs should never be used for scrubbing out halftones. It is not sufficient merely to wipe the surface of halftone plates, after proving, with a cloth, as the printing ink is bound to extend down into the engraved detail of the plates between the dots, and will remain and dry hard unless scrubbed out with a brush and a fluid.

There are several good methods of cleaning old halftones containing dried ink and dirt, any of which may be followed. The best-known methods are as follows:

1. Pour on the face of a halftone a portion of benzine or gasoline or kerosene, then briskly rub the "highlight" sections of the halftone with an ordinary rubber eraser. Repeat this operation two or three times, and then wash out the detail of the plate with a soft brush and benzine.
2. The same method of cleaning can be done with peroxide, wood alcohol, vinegar or ammonia, using a rubber eraser, and then finishing the cleaning with pure water.
3. In the case of an old halftone which has been filled up with dried ink and dirt for a long time, first sprinkle common table salt over the surface of the plate, then apply a small quantity of acetic acid; rub the entire surface of the plate with a soft brush, and finally remove all traces of the salt and acetic acid with a brush and pure water.

Tested Ink Removers

There is incorporated in a report by Public Printer Carter, a series of comments on detergents for the removal of ink, made by the chief of the Bureau of Tests. He says in part:

"An investigation has been conducted relative to the removal of ink from type, the removal of wax from electrotype shells, the cleaning of press rollers, and the cleaning of ink containers. There are two types of detergents commonly used in the printing industry, *volatile solvents* and *alkali cleaning agents*. As a result of this work, the following detergents have been recommended and are now in use by the Government Printing Office:

"1. Aviation Gasoline—This quality of gasoline is used for cleaning type where quick drying of the cleaned surface is necessary. It readily removes the ink from the surfaces of the type and after evaporation leaves the surface dry and free from oil. Work done with present-day commercial grades of motor gasoline has shown that they are unsuitable owing to the oily residue

left on the type, which will not evaporate and is difficult to wipe off. This oily residue interferes seriously with the taking and retaking of proofs, and in the making of *stereotype matrices* it blisters the *tissue*.

"2. BENZOL—Pure water-white benzol is used for cleaning type in instances where the aviation gasoline will not remove the hardened or dried ink. This material is a better solvent than aviation gasoline. It is also used for cleaning *numbering heads* on presses. This material has replaced solvent naphtha.

"3. MIXTURE—*Benzol 60 per cent and Acetone 46 per cent*—This is the most powerful solvent mixture adopted by the office, and is used for removing hardened ink from halftones and old type, which cannot be removed by aviation gasoline or benzol alone.

"4. MOTOR GASOLINE—The commercial grade is used for washing press rollers and press forms while on the press. For this purpose it is more suitable than aviation gasoline, as the oily residue aids in preserving the rollers. All of the solvents named—aviation gasoline, benzol, acetone-benzol mixture, motor gasoline, and kerosene—are inflammable.

"5. KEROSENE—Used for removing wax from the face of electrotype shells. It is also used for cleaning press rollers.

"6. TRI-SODIUM PHOSPHATE CLEANING MIXTURES—Formerly strong caustic soda, known as lye, was used to a large extent for removing ink from type forms, especially when the ink had hardened, and for cleaning ink containers. Strong caustic alkali solutions, usually applied hot, have several disadvantages. A caustic solution injures the human skin, possesses an objectionable odor, and leaves an alkali film on the cleaned metal, which it is difficult to remove. The lye solution, which cannot be thoroughly washed out of the type, also injures the thin tissue of the stereotype matrices when heat and pressure are applied.

"In order to avoid the use of strong alkali, cleaning mixtures were developed containing *tri-sodium phosphate, soda ash,* and a small percentage of *caustic soda.* The formulas, containing varying proportions of these ingredients, have been experimented with, each of which gave satisfactory results. These cleaning mixtures are not injurious to the human skin, do not possess any objectionable odor and leave the surface of the metal clean and free from alkali film. They are also used for cleaning ink containers.

	No. 1 per cent	No. 2 per cent
Tri-sodium phosphate	40	80
Soda ash	45	..
Ground caustic soda (95 per cent)	15	20

"These materials must be mixed in the proper proportions for use as needed. These mixtures are used the same as caustic soda, approximately one pound in a gallon of hot water. The surface cleaned must be thoroughly rinsed with hot water after use of the cleaning mixture.

"A saving incident to the use of these mixtures is in the item of brushes.

When caustic soda alone was used, a palmetto or vegetable fiber brush seldom lasted more than one day. With the new type cleaner, a brush will last from four to five days."

These comments by the chief of the Test Bureau are interesting and useful, and will, no doubt, help solve the problems the printer has to deal with in cleaning many galleys of type and materials after they have been used for printing purposes.

Revising the Galley

As soon as all the corrections in the type have been made, the type should be tied up, and a second proof taken. The second proof is called a *revise,* and it serves as a check-up method in order to make sure that all corrections have been properly made by the compositor. Sometimes new errors are made in correcting the first ones, through either carelessness or a misinterpretation of the proofreader's marks. The revise is sent, with the original proof, to the proof-room, where it is carefully looked over and compared with the first proof. If it contains further errors, these are marked, and the revise proof is returned to the compositor for correction. A third proof, or *second revise,* may be taken; sometimes even a *third revise,* if necessary.

Speed in Typesetting

Systematic, careful type *distributing,* which results in giving the compositor confidence in his case, will be found to accelerate his speed materially. The action of a man working out of a dirty case is not unlike the walk of a blind man—hesitating, halting, and groping, he knows not where or upon what. In contrast, the action of one working at a clean case is like the firm tread and sure step of the man blessed with sight. A clean case therefore is one of the first requisites of quick typesetting, enabling one to compose without stopping to sort out the case, or losing time afterward in changing letters which should have been right in the first place. Another factor in rapid composition is a determination not to make any false motions. This, however fruitless it may at first appear, will, in a short time, perceptibly increase the number of ems set. The operation of typesetting may be quickened by sighting the nick before the hand goes out to pick up the type, so that when it is taken by the thumb and forefinger there will be no necessity for turning it around to see where the nick is, the hand meanwhile making a

false or lost motion that would have sufficed to bring another type to the stick. False motions not only consume time but eventually become chronic and increase in number and intensity so that a compositor may fairly "shake himself to pieces" and yet have only a small result to show for his expenditure of energy.

Errors in Setting Type

The possibilities of making errors in setting type are multitudinous. If, for example, we take the three-letter word art, and transpose the letters, we may produce five different permutations: atr, rat, rta, tra, tar, not any of which spell "art," and which are therefore errors. Twenty-four different transpositions are possible with any four different letters. Example: east, eats, etas, esta, esat, etsa, aest, aets, aset, aste, ates, atse, stea, stae, saet, seta, seat, sate, tsea, tsae, tesa, tase, teas, taes. The mathematical formula for the permutation is this: ${}^4P_4=(1 \times 2 \times 3 \times 4)=24$. Five different letters can be transposed 120 different times. Any eight different letters can be shown in 40,320 different permutations: ${}^8P_8=(1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8)=40{,}320$. The longest list of actual words which can be formed with eight letters is: caterers, reacters, recasters, recrates, retraces, terraces. In setting the word "caterers" it is possible to make 40,319 errors through transpositions. The letters ieaugnsrm, nine in number, can be transposed into 368,879 other arrangements, but only two of them spell actual words. Which are they?

From the foregoing explanation it can be seen that typesetting must be done with the greatest possible care, in order to avoid the multitude of errors that could be made.

Advice to Compositors

Stand squarely on both feet; heels together, toes turned outward. Do not lean against the frame or stand which holds the cases. Correct posture in standing and walking is regarded as absolutely necessary in order to maintain physical health.

Be sure to get full instructions and directions as to width of measure, size, and style of type before going ahead with the composing.

Read your copy over before you start setting it into type, in order to get the sense of it; the little time required for this will be nothing compared to the time needed to go back and make a change in the preceding line in case of misreading indistinct copy.

The copy should be placed where it can be seen best, at the left-hand side, above the lower-case letters, or slightly toward the right, if a double set of cases is used. The boxes of the case from which the compositor works should not be covered with the copy.

The reading of copy should be done slowly and carefully, and the compositor should always carry in his memory enough words to fill one line. The rattle-headed fellow who must refer to his copy for each word, or set one or two at a time, and is constantly hunting for his place, need never hope to become a good compositor; and unless he reads his lines over when justifying, he will always set "dirty" proofs.

Keep your mind on the work, and your eyes on the copy. Do not set in type anything which you cannot spell or understand, trusting to luck that you are getting it right; ask someone, or consult a dictionary.

Be silent while at work; the click of the type as it is placed in the stick should be the only noise near the compositor's workstand.

In justifying lines be careful not to bend the thin spaces in an attempt to spread out the line a little; if they will not go in easily the line is too tight. Spaces which are bent cannot be used again, and must be thrown out of the case.

Read the lines over in the stick before emptying them onto the galley. Make sure the type is squarely on its feet in the stick when you justify the line; if it is not, the line will be short when it is straightened up on the galley. When justifying quadded lines, keep the spaces next to the type; this will help to keep odd spaces out of the quad-box when distributing. Don't put them between the quads or at the end of the line.

Look out for your composing stick; if it has a screw clamp, try the thumb-screw occasionally to see that it does not work loose after you start composing, thus making your last lines wider than your first.

Do not allow type to fall on the floor or to be scattered about the workstand. If a letter should accidentally drop, pick it up immediately and put it where it belongs.

Avoid the tweezers and bodkin. They are dangerous to the type and to the habits of the beginner who learns to depend upon them to perform the work that is properly done with his fingers. In many printshops the use of tweezers and bodkin is entirely forbidden. On Monotype composition, when wrong letters are to be discarded, tweezers may be useful.

Do not put leads, type, or other composing-room materials in your mouth.

After a job is finished, see that all materials—extra leads, slugs, cord, etc.—are placed where they belong.

Division of Words

A thorough knowledge of the correct division of words of our difficult and complex English language is not easily acquired. Even experienced printers occasionally fail to carry over from the end of one line to the next the proper number of letters.

am'pli-tude (ăm'plĭ-tūd), *n.* [L. *amplitudo:* cf. F. *amplitude.* See AMPLE.] **1.** State or quality of being ample; extent of surface or space; largeness of dimensions; size.
The cathedral of Lincoln . . . is a magnificent structure, proportionable to the *amplitude* of the diocese. *Fuller.*
2. Largeness, in a figurative sense; breadth; abundance; fullness; as of: **a** Extent of capacity or intellectual powers. "*Amplitude* of mind." *Milton.* "*Amplitude* of comprehension." *Macaulay.* **b** Extent of means, resources, splendor, etc.

com'ple-ment (kŏm'plē-mĕnt), *n.* [L. *complementum:* cf. F. *complément.* See COMPLETE, *v. t.*, and cf. COMPLIMENT.]
1. Act of completing or fulfilling; accomplishment; state or fact of being complete. *Obs.*
2. *Her.* Fullness (of the moon); as, the moon in her *complement.*
That which fills up or completes; as: **a** The added . . . by which a predication is made complete.

opinion or belief without sufficient evi . . . is only an infallibility upon *supposition* that if a . . . true, it is impossible to be false. *Tillotson.*
His means are in *supposition.* *Shak.*
Sup'po-si'tion-al (-*al*), *a.* Resting on supposition; hypothetical; conjectural; supposed. *South.*
Sup-pos'i-ti'tious (sŭp-pŏz'ĭ-tĭsh'ŭs), *a.* [L. *suppositicius.* See SUPPOSITION.] **1.** Fraudulently substituted for something else; not being what it purports to be; not genuine; spurious; counterfeit; as, a *supposititious* child; a *supposititious* writing. *Bacon.*
2. Suppositional; hypothetical. [*R.*] *Woodward.*
Sup-pos'i-ti'tious-ly, *adv.* *Sir T. Herbert.*

FIGURE 17

How the dictionary divides words—hyphens and accent-marks indicate syllables.

In the paragraphs which follow a few general rules for the division of words in printed matter are given—and a table of word terminations is appended.

The young compositor, when he is in doubt about a word-division, consults *Webster's Dictionary* or some other reference book—which is as it should be. But one must not suppose that any dictionary shows just where every word can be divided. Dictionaries show nearly everything

pertaining to words, as spelling, capitalization, syllabication, pronunciation, etc., but for correct division certain general rules must be understood.

In Figure 17 (reproduced from *Webster's Dictionary*) the hyphens in the words show the number of syllables that each word contains, but not the place of division. Wherever the accent mark ′ (to aid pronunciation) occurs, the hyphen has been omitted. Any word may, however, be divided at the end of an accented syllable, if it can be divided at all.

Amplitude may properly be divided in two places—am-pli-tude. Complement may be divided in two places—com-ple-ment. Suppositional has three (and in an emergency four) places of division—sup-po-si-tion-al.

The material below, and also on the next page, was taken, with a few changes, from *The Printer's Manual of Style,* by F. W. Hamilton, LL.D., published by the United Typothetæ of America, Washington, D. C.

In the specimen words shown, the hyphen in each word indicates the preferable place of division, without sacrificing good spacing; but some of the words printed may be divided elsewhere.

Rules for the Division of Words

In general, in the United States, it is customary to divide according to *pronunciation,* and not according to etymology, which is the system preferred in England. As far as possible, if consistent with pronunciation and good spacing, division of words should be according to *meaning* and *derivation,* where known:

> *un-even,* not une-ven; *auto-mobile,* not automo-bile;
> *en-abled,* not ena-bled.

Divide on vowels wherever practicable. A single vowel, which by itself forms a syllable in the middle of a word, should not be carried to the next line:

busi-ness	lazi-ness	noi-sy
trou-ble	criti-cism	particu-lar
pa-tron	sepa-rate	wo-man
pro-gress (*verb*)	prog-ress (*noun*)	hu-mor
memo-rial	(mem-ory)	(mem-oir)
pro-duce (*verb*)	prod-uct (*noun*)	sa-voir

When two consonants meet between vowels, and the syllable ends on one consonant, the division may often be made between the consonants, the pronunciation determining the place of division:

advan-tage	exces-sive	gram-mar
profes-sor	plain-tiff	scur-rilous
mas-ter	moun-tain	mil-lion

When three consonants come between two vowels, the first of which is short, the division comes after the first consonant:

chil-dren	frus-trate	han-dle

Words composed with a prefix should preferably be divided after the prefix:

dis-avow	in-justice	un-common

Avoid additional hyphens in compound or hyphenated words if possible:

fellow-being	poverty-stricken	object-lesson

Do not divide *nothing, o'clock, above,* and similar words.

Do not divide words of four letters; nor words of five or six letters if it can be avoided. Good spacing is, however, of first importance.

Do not divide a word so as to end or begin a line with one syllable, unless the measure is very narrow.

Do not divide words of two syllables pronounced as one, including past participles of short words:

heaven	power	prayer	beamed	often

Do not divide an amount stated in figures if it can be avoided; but if such division is necessary, the hyphen should follow the comma.

Do not divide proper names, especially those of persons, if it can be avoided; nor titles, or such combinations as A.M., P.M., B.C., a.m., p.m.

Do not divide the last word on a page so as to carry a part of it to the next page; nor the last word of the last line of a paragraph.

A Table of Word-Divisions

(Taken from The Inland Printer)

The following twenty-five final syllables are contained in thousands of words in the English language. The formulations do not mean that the divisions shown are the only correct ones, but they signify that each

termination in the first column shows the last place at which the words, in ordinary composition, may be divided. The words in the column at the right side of the table are wrongly divided.

Ending Syllable.		*Wrong Division.*
-cally	radi-cally, periodi-cally, physi-cally.	magic-ally
-ceous	herba-ceous, poma-ceous, farina-ceous.	cetace-ous
-cial	gla-cial, espe-cial, so-cial, offi-cial.	spec-ial
-cient	defi-cient, effi-cient, profi-cient, an-cient.	suffici-ent
-cion	coer-cion, suspi-cion.	coerc-ion
-cious	auda-cious, rapa-cious, gra-cious, vera-cious.	suspic-ious
-cism	Catholi-cism, athleti-cism, fanati-cism, agnosti-cism.	critic-ism
-dure	en-dure, or-dure, proce-dure.	verd-ure
-geous	umbra-geous, outra-geous, disadvanta-geous.	courage-ous
-gion	le-gion, re-gion, conta-gion.	relig-ion
-gious	reli-gious, prodi-gious, liti-gious, sacrile-gious.	contagi-ous
-rily	extraordina-rily, satisfacto-rily, customa-rily.	ordinar-ily
-rior*	supe-rior, infe-rior, inte-rior, ante-rior, exte-rior.	exter-ior
-sion	vi-sion, abra-sion, confes-sion, divi-sion, diver-sion.	remiss-ion
-sive	eva-sive, adhe-sive, fen-sive, defen-sive, mas-sive.	mass-ive
-sory	promis-sory, illu-sory, acces-sory, sen-sory.	curs-ory
-tian	gen-tian, fus-tian, ter-tian, mar-tian.	Christ-ian
-tient	sen-tient†, quo-tient, pa-tient.	quot-ient
-tion	condi-tion, addi-tion, sub-trac-tion, elec-tion.	attract-ion
-tious	vexa-tious, propi-tious, ambi-tious.	fictiti-ous
-tive	promo-tive, attrac-tive, ac-tive, effec-tive.	elect-ive
-tor	direc-tor, ventila-tor, eleva-tor, instruc-tor.	conduct-ors
-tory	depreca-tory, prefa-tory, obliga-tory, perfunc-tory.	transit-ory
-tude	infini-tude, solici-tude, quie-tude, turpi-tude.	habit-ude
-ture	fu-ture, tex-ture, na-ture, lec-ture.	moist-ure

*Plurals may run ors over, as exteri-ors.

†*Webster's Dictionary* divides this word: sen'ti-ent.

CHAPTER X

DISTRIBUTION

Putting the type back into the case, and placing the materials used in composition back in their proper receptacles, is called *distribution.* Type ready for distribution is technically known as "dead matter," and it is usually so marked in the proof, or by means of small signs laid on the type or the galley containing the matter. In many shops there is a special place in a galley cabinet or rack designated where all "dead matter" is kept. The young compositor should never distribute type until he is absolutely certain that it has been printed and is of no further use as it stands. The beginner should proceed with his work very carefully. He should examine a few letters of the type which he intends to distribute in order to determine to which font they belong and into which case they must be laid. By a close comparison of the face of the type with the letters that are in the case and by observing the location of the nicks, the student should be able to decide which type characters belong to the same font. These are some of the features, as well as the lay of the case, with which he must become familiar. If he does not know the location of every letter in the type case, he should place a diagram of the case within view, so that he may refer to it whenever necessary.

Putting Type Back into the Case

The beginner should start by taking only one line at a time in his hand, and only three or four types between his thumb and forefinger at a time to drop into the boxes. Later, when he becomes proficient, he can take up a number of lines, and pick off complete words to put back into the case. Speed in distribution can be acquired only by much practice. Because every letter that is dropped into the wrong box will cause a delay when the type is used again in composition, no advantage is gained by hurried, inaccurate distribution. Those who are careful in distribution are the ones who make the fewest errors in composition. Theodore Low DeVinne says of distribution:

"Distribution is much more difficult to the novice than composition. . . . When distributable type contains unusual words, the spelling of these words

should be understood before their types are parted. It is better to read the line, and to take up the full word when it can be done. The eye should follow the type in hand until it drops into the right box."

When a careful compositor distributes lines which he himself has set, the spelling of common words may not be necessary, but unusual words should always be spelled out before distributing. (This spelling is done quietly, not aloud.)

Distributing Pi

All beginners will pi type during distribution or composition. It is one of the things that is to be expected during the apprenticeship of the young printer. When this happens, the letters should be set up in the composing stick, with the nicks outward, just as is done in setting type from copy, but without any attempt to form regular words.

Instruction: Set the stick at a convenient short measure, and pick up all the letters first, placing leads between the lines if there are several lines of pi to be set; then set the spaces by putting all of one thickness together. Finally, after all the pi has been set up in the stick, proceed to distribute it in the usual way; but all letters must be watched, as they usually form an unintelligible mass.

Lifting Up the Type

Instruction: In taking type from the galley for distribution, see that there are two or three leads or a slug at the top and at the bottom of the mass. With the thumbs back of each end of the last line (the line nearest you), squeeze

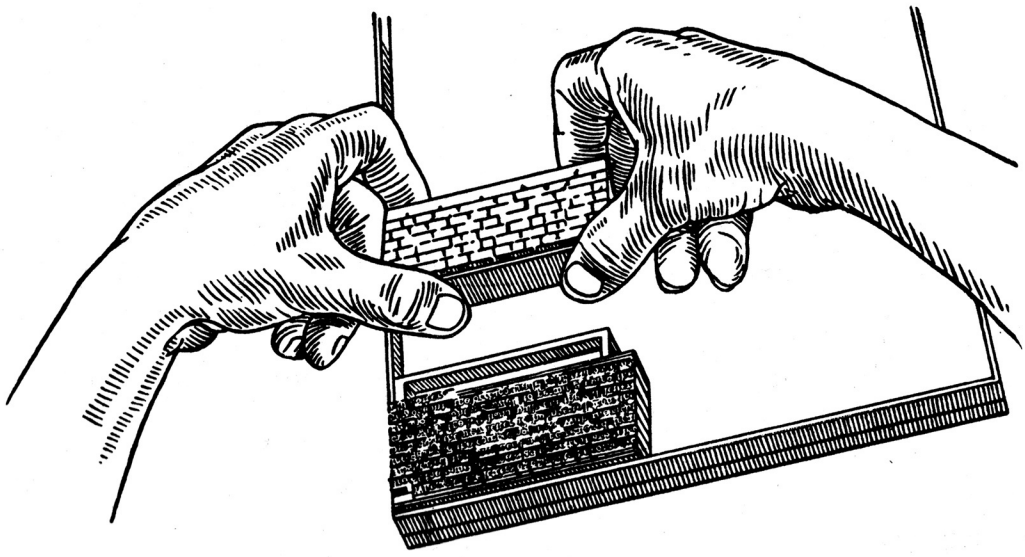


FIGURE 1

Pushing a few lines of type toward the bottom of the galley, in order to obtain a firm hold on the lines before lifting them up.

the ends of the lines toward the center and with the index fingers hold the sides, as he mass is moved slowly toward the open end of the galley. After moving the type forward, it is gripped tightly, and is then quickly tipped to a horizontal position, with both thumbs down, the face of the type toward you, and the nicks up. (Never keep type in a vertical position any longer than necessary while distributing.) Now slide the left thumb toward the center and the fingers around toward the bottom of the mass, the right hand

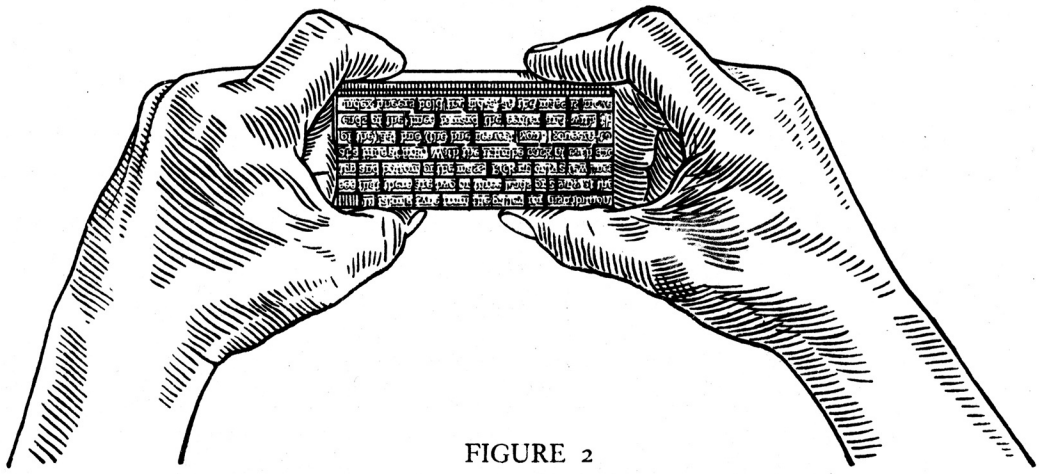


FIGURE 2

The same lines, held in both hands, ready to be shifted into the palm of the left hand, before beginning distribution.

meanwhile pushing it into the palm of the left hand. The type should rest against the lower part of the thumb and on the second or third finger of the left hand. The fourth finger may also be used if the job has many lines.

How to Distribute

Instruction: Place the type line in the left hand, well down in the palm, not upon the ends of the thumb and finger. The nicks of the type should be upward. Spell the words before taking them from the line, and note the b's and d's, p's, q's, n's, u's, letters which will be confused at first, until you get familiar with the inverted appearance of the type. Note also the slight difference between the size of the small capitals and the ordinary lower-case letters. Look closely to distinguish between the o, s, w, v, x, z of the two sets of types. In some fonts the difference is so slight that experienced compositors may not always be sure of distinguishing them. Some fonts have the small capitals marked with an extra nick. As a rule, the small capitals are larger and slightly thicker in set than the lower-case letters.

In fonts of oldstyle type the figure 1 is so nearly like the small capital I that a worker will note the difference chiefly because the figure is on an *en* set and the small capital letter is on a thinner set. The lower-case o and oldstyle cipher o are also easily confused. The cipher is usually rounder than the letter o.

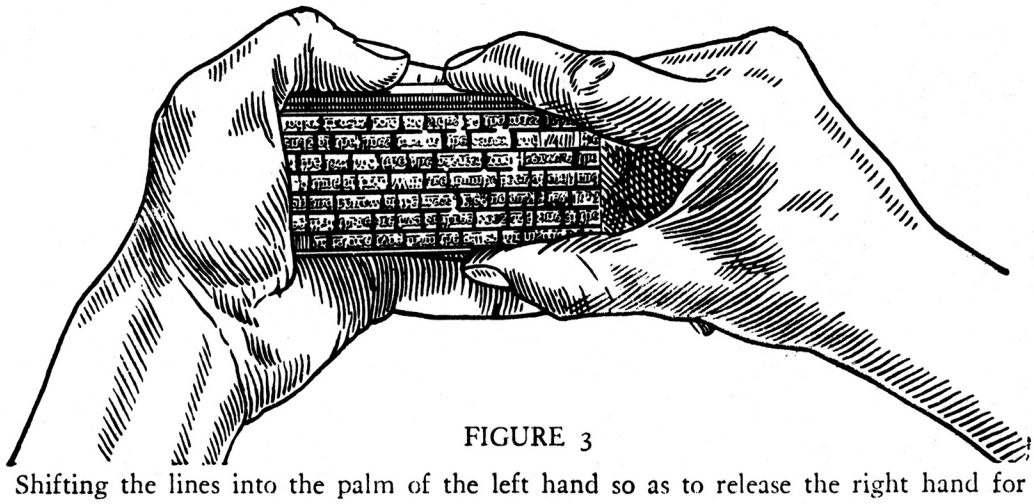


FIGURE 3

Shifting the lines into the palm of the left hand so as to release the right hand for distribution.

Drop the letters sideways, with their faces slightly upward (as shown in Figure 6), one at a time, into their respective boxes, the forefinger and second finger of the hand gently pushing the types apart as one after another is dropped into the case.

It is now a common practice to distribute type dry. Sometimes it may be advisable to sponge it with water. If the type is solid (without leads)

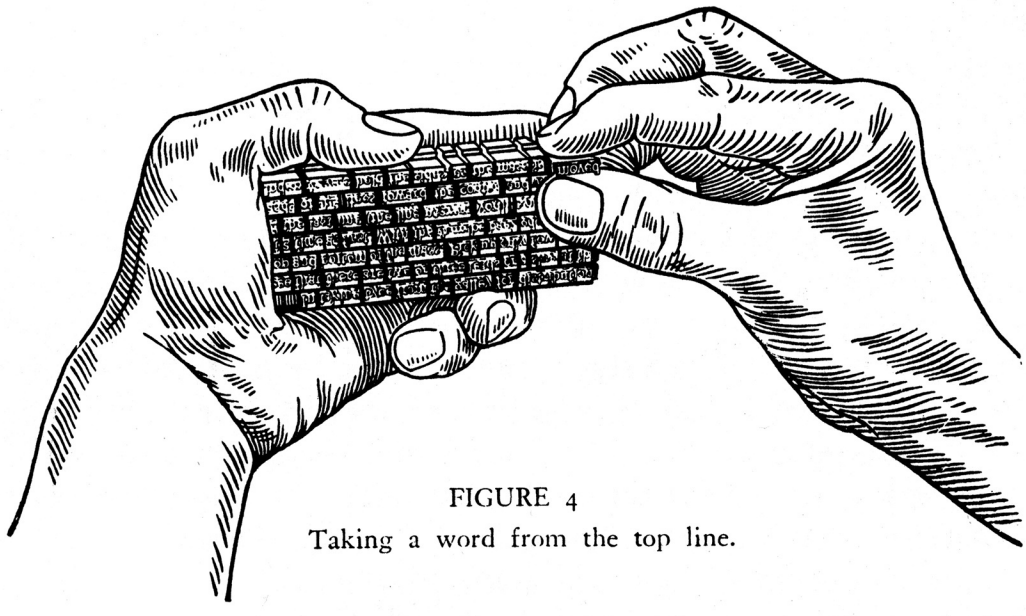


FIGURE 4

Taking a word from the top line.

and the lines crumble, the dampness makes the types adhere slightly. If the types are "caked" or stuck together from any cause, a careful sponging will loosen them so that they can be distributed more easily. New type that has been standing for a long time may be sponged with hot water to separate the pieces.

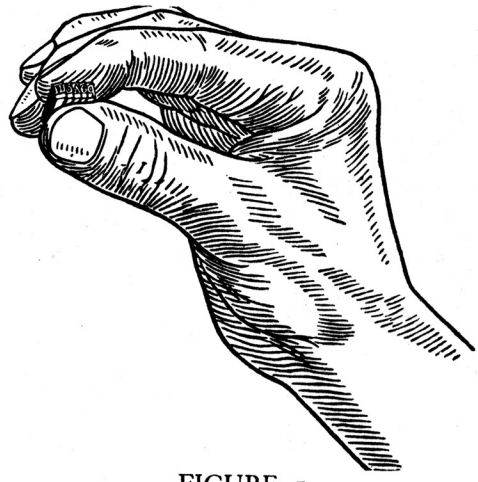


FIGURE 5
Holding the word between the forefinger and the thumb.

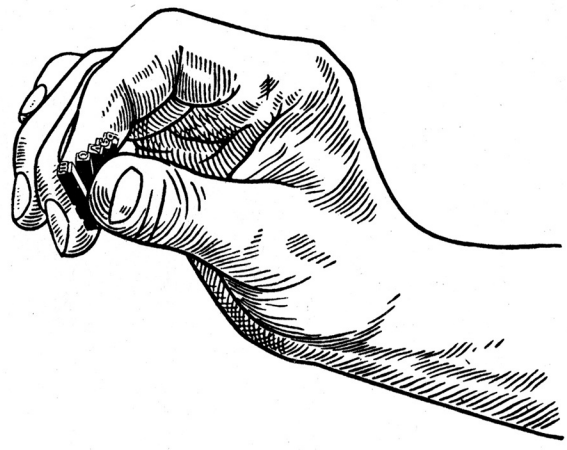


FIGURE 6
Bringing the second finger down and toward the palm of the hand to separate the types and drop them into the case.

Advice on Distribution

Efficiency in the composing room is largely due to the coöperation of the workers therein. The careful compositor is usually the efficient one; he does his work with the fewest movements or motions, and he does it so well that it need not be done over by someone else; he does it right the first time. The careful compositor has his mind on his work, and he thinks before he acts. Mixing up cases is seldom the work of a careful compositor; it is due to carelessness in distribution. Sometimes it is due to the desire to distribute rapidly. It is better to distribute slowly and accurately than rapidly and inaccurately. Distributing the wrong types in cases may result from a lack of knowledge; but if a compositor hasn't the knowledge to distinguish one type-face from another he may acquire it by studying and comparing the faces in the composing room. Until he knows one type font from another he should always ask someone who does know, and thereby avoid making mistakes. Each character should be put where it belongs. It does not take any longer to put types in the boxes where they belong than where they do not belong. But it does take a great deal longer than it should to set and justify a stickful of type if the letters are in the wrong boxes, and the space box that is supposed to contain only three-to-an-em spaces also contains en quads, four-to-an-em, and five-to-an-em spaces. Someone will lose time in composition if the case is not "clean," although it may not always be the man who is responsible for mixing it up. In distribution, the student should be sure that the *face* and *size* are right by comparing

several letters in the case with the type he is to distribute, then see that the *nicks* are the same; and finally, put the types in their respective boxes.

Large-sized types, 24-point or larger, should always be placed, one at a time, face-up in the case. Letters should never be thrown into the boxes, as this would bruise or break the edges of the face or serifs of the characters. All shaded, open-face, outline, or inline letters must be handled with special care—these are very easily damaged because they have fine and delicate lines.

In working at distribution, the cases should not be filled to overflowing, that is, so full that the characters of one box will shift into adjoining boxes every time the cases are pulled out of the stand or moved. Nearly all printshops have special cases or boxes—called *sorts* cases or boxes—into which all surplus types are placed. Some jobs of composition require more figures and punctuation marks than others, while other jobs may require an extra supply of capitals and of some lowercase letters. Hence, to make allowance for this inequality, extra supplies of types for the different fonts must be kept on hand.

In shops where Monotype materials are used, small sizes of body type—from 5- up to 14-point—are usually not distributed after printing therefrom. The body type is thrown aside, to be melted over; but sizes of 18-point and larger are distributed back into cases and used again. Spaces and quads are sometimes saved. Care should be taken not to mix small sizes of Monotype spaces and quads with the spaces of foundry type fonts, because these are not of the same relative thicknesses. The Monotype spaces are cast on a unit system having 18 units to the em, whereas the foundry spaces are cast on the point system (having 12 units to the em).

While distributing type, the leads and slugs used for spacing material in the jobs should first be placed in an orderly manner at the foot of the galley. Putting away the leads and slugs in their proper places is best accomplished by separating the leads from the slugs, and then sorting each according to length. If the job to be distributed contains brass rules, these are usually extracted at the beginning and placed on a galley. Do not throw the rules, leads, and slugs around carelessly, as this may bend the edges, and injure them.

Reglets (wood slugs), which are used in schools and shops for the setting of placards and posters, are usually kept in a special case, and they should always be put where they belong. Like all wood furniture,

these must not be brought into contact with water or moisture. Kerosene or gasoline or other oily solutions will not injure them.

Leaders, which are used in tabular matter, should be put in their respective places. They are generally kept in boxes with three compartments, in en, em, 2-em, and 3-em sizes. The 2-em and 3-em sizes are kept in the same compartment. They are cast on point-size bodies, that is, 8-point, 10-point, and 12-point, etc., and each should be placed in the box of its particular size and style.

Borders, which are used in job composition, are kept in special cases. In distribution, each border should be kept standing on its feet, so that the many different styles can be easily distinguished from one another when they are to be used again.

Distribution of Pi of Several Sizes

Instruction: As has been previously stated, all pi—if it is more than a few letters—should be set up in a stick in as many lines of a convenient length (about 20 picas wide or less) as it will make before attempting to put it back into the case. Insert leads between the lines, but do not spend any time in justifying them; leave the lines loose. This method may easily be pursued when the pi is all of one size, but if various sizes and fonts of type are jumbled together in pi, set one line of *one size* at a time; then group letters having the *same nicks* together, and finally place letters with the *same face* together. This will facilitate the identification and distribution of the pi.

Cleaning Brass Rules

Instruction: When proofs are taken of jobs containing brass rules—or when such jobs are printed on the press—the ink collects at the upper or printing edge of the rules and has a tendency to dry there. In distributing or dissecting such a job, it is best to lay the rules flat on a metal galley. Sprinkle the rules with kerosene or benzol and rub them gently with a clean rag; or, if the job has been standing for a long time, a piece of soft wood may be used to scrape the ink (which will be dissolved by the fluid) off the rules. The little wooden strips which come with fonts of type are excellent for cleaning brass rules in this way. Use the end of the wood, not the flat side. After all the ink has been removed, wipe the rules with a dry rag and put them into the case where they belong. It is not easy to tell the different rules apart, and it therefore behooves the apprentice to look sharply at the face of the rule before putting it into the case. The bottoms or feet of many rules look alike—if they are on a 2-point body.

How to Lay Foundry Type

Instruction: New foundry type, direct from the maker or supply house, comes in packages of various sizes and weights, which will depend upon the

point-size and quantity of letters to the font. In order to make it easy to lay new type into cases, the manufacturers assemble all letters of one character together in 30-pica lines, which are held intact by a few small wooden strips and cotton twine tied around the whole mass. The first line (sometimes the second and third also) of a lower-case font usually contains all the letters a; then follow the b, c, and so forth. In laying or distributing such new type, a good practice is to place the package on a galley and carefully remove the paper wrapper by unwinding it far enough to expose the face of the type. Now sprinkle the type with gasoline. Hold the type with one hand, and gently pull the wrapper away from under the type; then push the type to the rim of the galley. Untie the cord from the type and proceed to lay one row of letters, or as many as can conveniently be lifted at one time, into the case. As in all distribution, the bottom lines are put into the case first, and the upper lines last.

How Halftone Engravings Should be Handled

Halftones are delicate objects; their printing surface is composed of thousands of fine dots—sometimes they are so fine that they cannot be seen with the naked eye. If any of these are bruised or rubbed off, the halftone will not print clearly.

It is an easy matter for one little speck of grit to make a scratch that the eye cannot see—yet when a proof is made from the engraving, that scratch shows as an unsightly white line or mark.

Instruction: Fold a piece of soft blotter over the edges of the engraving and tie it with soft twine or tape. Never use rubber bands, as they contain a chemical which will ruin the engravings. Never pile one halftone on another without blotter or soft pasteboard between them.

Electrotypes and engravings should be stored in a dry place, away from steam pipes. The engraver uses great care in his selection of blocking wood, but the best of wood is not proof against careless handling, and constant changes in temperature and humidity.

And what is true of halftones is equally true of all other printing plates; they should be carefully handled at all times.

NOTE—The illustrations for Figures 1, 2, 3, 4, 5, and 6 in this chapter, and several in the previous chapter, were taken from actual photographs, and the drawings for the line engravings were made from these by George F. Trenholm, the well-known Boston designer. Mr. Trenholm learned to set type in one of the author's classes.

CHAPTER XI

PRINTERS' PROOFS

A printer's proof is a trial impression taken from type. When the compositor has finished his work of setting the type lines, they are placed on a galley and are tied up with page-cord, which is a strong cotton twine. Sometimes the lines are fastened by means of quoins and a *sidestick,* or with some other device, in order to prevent them from spreading and the type from falling apart while the proof is being made. All first proofs are usually *galley proofs.*

How to take galley proofs is fully explained in Chapter IX, Composition. Different styles of proof presses, and their mechanism, are described in Chapter VI.

Printers' proofs may be grouped under several heads: *Galley proofs, stone* or *planer proofs,* and *press proofs.* Galley proofs include first proofs, revises, author's proofs, and proofs used for making dummies. Stone-proofs are usually taken of forms that are too large for the proof press, either before or after the pages have been imposed, and arranged in signatures. The press proofs are the final proofs and are compared with the author's last proof to see if the corrections marked thereon have been correctly made. In addition they show whether or not the pages have been properly imposed. They also show whether or not the margins are accurate and the positions of illustrations are correct.

The Galley Proof

By far the greatest number of proofs that are pulled in the composing room are made on some kind of proof press. The type, which is on a galley, is placed on the bed of the press, as nearly as possible in the center, and is carefully inked by means of a small hand-roller or brayer. The ink should be repeatedly rolled on the ink-table or slab, so that it can be thinly and evenly distributed upon the type. The kind and quality of ink to be used for printing proofs depend largely upon the kind of paper used: one must be suited to the other. The ink must not be too thick or

too thin, and just the right amount of ink must be rolled on the surface of the type that is to be proved. If too much ink is used it will dry slowly and will smear when the proof is handled, thereby obscuring words or letters, and finally, after the proof has been read, the marks which the reader has made. If too little ink is used, the letters will appear faint and it will be difficult to read them. This is especially true when proofs of small-size types (5-, 6-, 7-, or 8-point) carry too little ink.

If the proofs are to be read almost immediately after they are pulled, it is advisable to use a quickly drying ink which is fairly stiff. If proofs are not to be read at once, and can be laid out so that the ink can dry through absorption or by being exposed to the air, an ink may be used which contains but very little *drier*. The smaller the percentage of drier in the ink, the longer the inking slab will remain moist and workable. A quick-drying ink will also dry quickly on the ink roller.

The sheet of paper for the proof should be large enough to leave at least 1½ to 2 inches margin all around the outline of the type, for marking errors or changes.

The primary purpose of the proof is to detect errors which may have been made by the compositor or the author of the copy. This is done by comparing the proof with the original copy or manuscript from which the type has been set. The proof may also show how a page will look after it is printed.

The impression of the type on the paper is made, in one style of hand press, by drawing a heavy iron or steel cylinder (sometimes a solid roller), covered with felt, rubber cloth, or other packing, over the form. In another style of press the bed of the press, with the type, moves under the cylinder.

Various Kinds of Proof Paper

Dry paper is now universally used for taking proofs on proof presses. Many different kinds of paper can be used for these proofs. A good machine-finish (M. F.) paper, substance 50, 60, or 70, that is, paper weighing 50, 60, or 70 pounds to a ream of 500 sheets 25 by 38 inches in size, makes excellent proof paper. It is absorbent and not too hard. In some shops a medium-weight S. & S. C. (sized and supercalendered) paper is used for proofs. French folio, which is a thin, glazed paper and can be had in white or colors, is used in some printshops, but it is not so easily handled nor can corrections be marked as easily as on M. F. A paper known as "dry-proof" is frequently employed. It is thin and

slightly glazed on one side. Good substitutes for "dry-proof" paper are French writing, manifold, or glazed onion skin papers. Practically all paper supply houses handle onion skin, in various sizes and several weights. Of the thin papers, French folio is the cheapest. That weighing 12 pounds to a ream of 17 by 22 is a good weight to use for proofs. "Engravers' proof" is used especially for taking proofs of fine-screen halftones. This paper has one side of the sheet coated and highly finished.

The Stone-Proof

The stone-proof is one that is taken from type while it is on the imposing stone or table, either tied securely with cord or locked in a chase. Generally a sheet of damp paper is used, and for some kinds of forms a good proof may be obtained by placing another sheet of paper over the dampened one. Linotype or Intertype composition may be proved in this manner. If "dry-proof" or other thin paper is employed, it need not be moistened.

Instruction: Wipe the surface of the imposing stone or table with a cloth so that it is free from grit or dirt. Push the type from the galley onto the stone and apply the ink in the usual way. Take a sheet of paper that has been dampened evenly all over on one side with a sponge in order to make it a little limp. The unsponged side of the sheet is laid on the type very carefully in order to avoid slurring or smooching. Now take a planer and mallet used for pounding the impression. Hold the proof planer in the left hand and place it on top of the sheet of paper at one end of the form. With the mallet in the right hand, tap the planer gently. If the form is large, the planer will not cover it entirely, and therefore must be lifted from one part to another until the whole surface has been covered. This should be done by raising the planer slowly, with a tilting motion. Considerable practice will be necessary in order to avoid a shifting of the sheet on the type and making a double, or smooched, impression. A firm foundation for the type and a steady blow of uniform force, suited to the size and nature of the type or printing surface, are essential for making a clean impression. The mallet should be brought down in a vertical direction, without glancing sideways, and the planer should be held level and steady. Finally, after the impression has been made, grip the sheet with both hands at two ends and pull it off the type form by raising it higher and higher until it is entirely separated from the form. The term "pulling a proof" originated through this method of making proofs. The same term is now, however, also applied to proofs taken on proof presses.

Not all kinds of type forms should be proved on the stone. Those with large open spaces and small lines, and those with delicate lines like

scripts and kerned italic letters should not be proved with a planer if any other method is available. There is danger that the proof planer may batter the face or break off the kerns of the type-letters.

Taking Proofs in Two or More Colors

The usual way of taking proofs of a job that is to show two or more colors is carefully to dissect the type into as many forms, each on a separate uniformly sized galley, as there are to be colors. The bed of the press should be chalk-marked and a few key-proofs taken in order to determine the position of the different forms. All proof paper must be of the same size, and care must be taken not to smooch the ink while printing one color after the other. But even with all these preparations this method of making color-proofs is always a difficult one, as any slight shifting of the sheet will throw the forms out of register.

Another procedure in taking proofs in colors, from one form of type, which may be successfully followed, is to secure a small ink-roller and spread out one color at each end of the roller, leaving the middle section clean. (Several rollers or a split-roller may be used.) In inking the type, the colors are applied first, and then the black. The type should be untied and heavy metal furniture placed around it to hold it in place; or it may be locked in a chase. While applying the first color the lines not to be inked may be pushed away or a section of the type may be covered with a sheet of blank paper. After all lines have received their proper color of ink, the proof is taken in one impression. The only difficulty of this method is the inking; registry is, of course, easily obtained. Should the wrong ink get on some of the letters, rub it off with a clean dry rag. Very complicated color forms may require the taking out of lines onto another galley while inking, and then placing them back into the form.

Some proof presses have a special color-register device which simplifies the taking of proofs in color. The Vandercook press is among them.

Proofreaders' Marks

The proofreaders' marks or symbols date back hundreds of years. As early as 1483 some of the symbols were in use in Germany and in France. The early correctors of the press, as the proofreaders were called, made their marks somewhat different from the way the proofreaders of today are accustomed to make them, as may be seen from the specimens in this chapter; nor did they have as many marks as our proofreaders.

Because Latin was the first language in which books from movable types were printed, some of the correctors' marks are Latin abbreviations or contractions, and these were then used, as they are today, in order to save time and space in marking errors.

Qualifications of a Proofreader

The qualifications of a first-class proofreader are very fittingly described in *Appleton's American Encyclopedia,* as follows:

> "Very rare qualifications are requisite to be an excellent corrector of the press, or proofreader. Besides a familiar knowledge of the language in which the work is written, and of the technicalities of the typographical art, which is essential, and extensive and accurate information on general subjects, which is constantly useful, there is especially demanded an extreme precision in the habits of the eye. Hence, the term 'typographical, etc.' "

Although it is true that the reading of proofs for typographical and grammatical errors can be done by a college graduate, the printer with years of training and experience, provided that he is sufficiently well-informed, usually makes a better reader than the non-technical man.

Marks and Symbols of the Proofreader

The marks and symbols used by the proofreaders in the printing and publishing industry of America and Europe are shown on the following pages. In some offices, the marks of the older proofreaders may show slight variations from the marks given in this book, but in a general way they are the same. It must be understood that, just as no two persons write exactly the same handwriting, no two persons who function as correctors of the press will make the proofreaders' symbols in exactly the same way, but the similarity is close enough that even the novice can discern the meaning of all marks if he has a knowledge of the symbols here shown.

In the reading and correcting of proofs, it is to be noted that a sign should be made in the margin of the proof as well as within the text. The marks used within the text are the caret ∧, inverted caret ∨, underscoring lines —, =, ≡, slanting or diagonal stroke /, circle or ring mark ○, the close-up marks ○, and the transposition mark ∽, all of which must be used in connection with the marginal marks to indicate where the corrections are to be made.

Period. A period within a circle is placed in the margin of the proof, and a caret in the text to show where the period is to be inserted. The circle is placed around the dot or period in order that the correction will surely be noticed and not be mistaken for a comma or a spot on the paper.

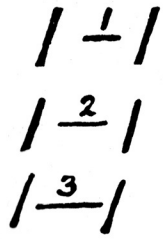
Comma. A comma, with a short slanting or diagonal stroke to the right, is placed in the margin, and the caret in the text where the comma is to be inserted.

Insert Apostrophe. To indicate the insertion of an apostrophe it is necessary to use the inverted caret with the mark in the margin, so that the mark may not be mistaken for a comma. Within the text the caret is used at the place of insertion.

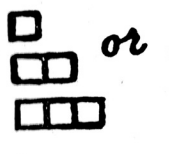
Colon. A colon, with the short diagonal stroke, is placed in the margin; the caret in the text.

Semicolon. A semicolon, the short diagonal stroke, and the caret are used to indicate this mark.

Hyphen. A hyphen is indicated by two short horizontal strokes and the diagonal stroke at their right. Most of the hyphens in type fonts have but one short horizontal or diagonal stroke, but the proofreader invariably uses two horizontal strokes in order to give his marks greater prominence and legibility.



Dashes. One-, two-, or three-em dashes are indicated by making a horizontal line in the margin between two diagonal strokes, and inserting 1, 2, or 3 over the horizontal line. For the one-em dash it is generally unnecessary to use the numeral over the short horizontal line.



Insert Em Quad or *Quadrat.* When a square is put in front of a line or word, it means that an em quad or quadrat should be placed there. This sign is also used in marking indentions for paragraphs. Two squares would mean two ems, and three squares would mean three ems, for the same purpose.

Paragraph Mark. This is used when matter which should begin a new paragraph is run in with the preceding one. This mark has been developed from the capital P (the first letter of the word "paragraph"). In order to avoid confusion with the capital P, the sign is made up of two vertical strokes and a loop on the left side, instead of on the right as in the capital P. A separating line is used at the beginning of the sentence where the paragraph is to start, with the paragraph sign in the margin.

No Paragraph. When the compositor has begun a paragraph where he should not, *"No,"* with the paragraph mark, is used to indicate the correction.

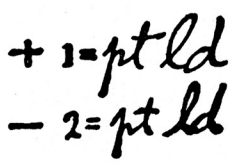
Caret. The caret is used to indicate where a word, letter, or any other character is to be inserted; also to show where space is to be inserted. The caret is used mostly within the text.

Insert Space. This sign is used in connection with the caret to show where space is to be inserted. The space-mark goes in the margin, and the caret in the text.

Less Space. This marginal mark indicates that the spacing between words is to be reduced. The mark within the text, showing where the space is to be reduced, is the inverted caret V and is to be used as a superior mark above the line.

Equalize Spacing. When the space between words is unequal, this sign is made in the margin to signify that uneven spacing of the words should be corrected. The spaces in the lines are marked at the bottom with a caret and at top with an inverted caret.

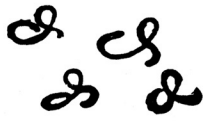
Increase or *Decrease Space Between Lines.* The two mathematical signs—*greater than, less than* (which are the same as the caret placed on its side)—indicate that the space between the lines is to be made wider or narrower by putting in or taking out leads.



Plus Leads, Minus Leads. Some proofreaders use the signs in correcting job composition to indicate the insertion of one or more leads of various thicknesses. Whenever possible, the *plus lead* or *insert lead* symbol should be placed in the left-hand margin of the proof, and the *minus* or *take-out leads* symbol in the right-hand margin.

Push Down Space. When a space or quad or an inverted letter shows in the proof, a short vertical line with a small curved stroke under it indicates that the correction is to be made in the type. The mark within the text is the usual diagonal stroke, thus /, over the visible space.

Broken or Defective Type. An "x" (without serifs) is made in the margin when a letter appears within the text that is defective, and a circle is drawn around the letter that is to be replaced. Some proofreaders draw a line under the letter to be replaced and a circle around the two cross-strokes forming the x in the margin. An x is also frequently used by editors or copy markers instead of a period, to indicate the close of a sentence.



Take Out Letters, Characters, or Words. The mark for taking out or deleting is the so-called "dele" mark and is used when a letter, word, or words, are to be taken out. This mark comes from the Latin word *delere,* meaning to destroy or efface. The marginal sign itself is a modification or corruption of an italic lower case d (first letter of the word *delere*). Among proofreaders, there is a greater variation in the making of this sign than any other one of the proofreaders' symbols. Four styles are shown.

Take Out and Close Up. Where one or more characters are to be removed within a word, the dele sign within the close-up marks is used in order that the word may not be split in two. It is also customary to use the close-up marks within the text above and below the letters to be removed.

Close Up and Draw Together. When a space has been inserted where it should not have been, a curved line is placed above and below the correction in the margin of the proof opposite the line where the mistake occurs.

Transpose Letter or Word. When a letter is out of order so that the word is incorrectly spelled, this sign is used in the margin. It is similarly used to correct a transposition of words. A stroke or the transposition mark is used within the text under or around the letters or words to be transposed.

Turn Right Side Up. This mark is used when a letter, word, or line has been set upside down, and it indicates that the inverted matter should be turned around. The letter or word to be turned is underscored within the text; if a whole line happens to be turned, a short stroke is also placed at either end of the line.

Wrong Font. Where one or more letters of a different kind of type from that in which the rest of the composition is set have found their way into the matter, this mark is used in the margin, and the wrong-font letters in the text are underscored.

Take Out Lead Between Lines. In ordinary composition where only one thickness of lead is used, this sign indicates that one lead should be taken out.

Let It Stand. If an author or proofreader marks a correction in a proof and afterward changes his mind and wishes it to stand as it was originally set or written, or where matter which has been scratched by mistake is to be retained, a row of dots is made under the words involved and *stet* is written in the margin. The word *stet* is of Latin derivation and means "let it stand."

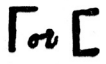
Place Within Quotations. When a word or sentence is to be enclosed in quotation marks, an inverted caret is placed within the text at the beginning and at the end of the word or sentence to be quoted, and the right and left quote-marks are placed in an inverted caret in the margin opposite the line where the correction is to be made.

Set in Lower-Case or Small Letters. If a certain letter, word, or words have been set in caps or small caps, but should be in lower-case, this mark is placed alongside the correction, and the matter within the text is underscored in the usual way.

Insert Asterisk or Star. This mark is used for notes of reference. The inverted caret is useful here, as it is in all cases of superior marks or figures.

Insert Superior Figure. This mark indicates that a superior (above the line) figure is to be inserted. The inverted caret distinguishes it from the regular and also from the *inferior* (below the line) figure.

Insert Inferior Figure. Figures in this position are used in chemical formulas. The caret determines the position of the figure.



Bring Matter to the Left. When it is desired to bring any word or lines over to the left, a bracket is placed at that point with the opening to the right. The bracket is also placed opposite the line in the margin of the proof.

Bring Matter to the Right. When it is desired to move matter over to the right, this is indicated by placing the bracket (with the opening toward the left) at the point where the line is to be moved. A similar bracket must also be placed in the margin of the proof.

Raise Word, Letter, Character, or Line. This mark is used both within the text and in the margin when it is desired to raise matter to a higher position. It is also used in display work where it is desired to change the position of a line.

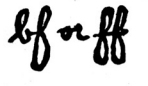
Lower Word, Letter, or Line. This mark is used to indicate that the position of a word or character is to be lowered. It is also employed in display work, and should be made within the text and in the margin.

Line Up Letters or Characters. When letters fall below or are raised above the line, parallel lines are put both within the text and in the margin, to indicate that an alignment is desired.

Make Lines Even. When the ends of lines show uneven line-up vertically, this mark is used in the margin where the lines appear uneven.

Use Ligature or Double-Letter Character. A curved line over the letters within the text shows the corrector that a ligature should be used where indicated. The letters are also written in the margin with a curved line above and below them.

Use a Diphthong. This mark indicates that a ligature should be used where the curved line is made within the text.



Set in Bold-Face Type. When a heavier letter is desired than the one which appears in the proof, the matter so to be set is underscored, and this is also indicated in the margin.

Set in Small Capitals. This sign indicates that matter is to be reset in small capitals. The words in the text which are to be changed are underscored with two lines.

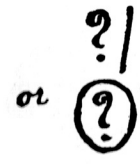
Set in Capitals. Words or matter to be reset are underscored with three lines within the text.

Set in Italics. Type that is to be reset is underscored with one line.

Set in Roman. When matter has been set in italics, and it is desired to change it to ordinary upright letters, this mark is used in the margin, and a single line is drawn under the word to be reset in the text.

Something Omitted, See Copy. This mark is used when part of the text—several lines or words—has been left out by mistake. This simple method calls the corrector's attention to the copy, where he gets the matter first-hand and saves the time of the proofreader. When only a word or two have been omitted from the copy, it is sometimes written in the margin.

Spell Out. When figures or abbreviations in the text are encircled (22), it indicates that they are to be spelled out. The words *spell out* are usually written in the margin of the proof. Some proofreaders and editors use the ring-mark to indicate that a word or words should be contracted, as one hundred dollars encircled would mean to make it $100.



The Query Mark. When the grammatical construction of a sentence or clause is questioned by a reader, and it seems desirable to change the form, the proposed correction is indicated by underscoring the doubtful text-matter and by placing a query (question) mark in the margin. If a statement or some figures within the text are thought erroneous or doubtful, the same procedure as explained here is followed. Queried corrections inside a ring are not to be made on the first proof, but are intended to go to the author. If it is desired to

have a correction made and the query referred to the author afterward, the query should be placed outside the ring. Great care must be used in marking queries. Proofreaders should know, not suspect, that they are errors, and be prepared to defend their corrections by recognized authority.

/ The short diagonal stroke / (which is called a separatrix), is used by proofreaders to call attention to a symbol by its side. It is also used to separate the corrections whenever there are several on a line in the margin of the proof.

⌐ This mark, within the text, is used by the compositor to indicate how far the copy has been set (if not entirely finished); it is also used by proofreaders to show the place where one galley ends and another begins, the perpendicular bar being the end of one and the beginning of the next. Opposite it, in the margin of the copy should be written "Gal. 6," or whatever the number of the galley may be, thus

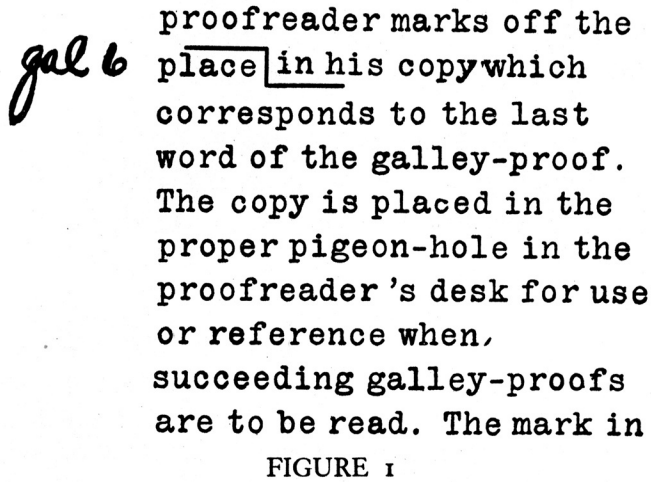


FIGURE 1

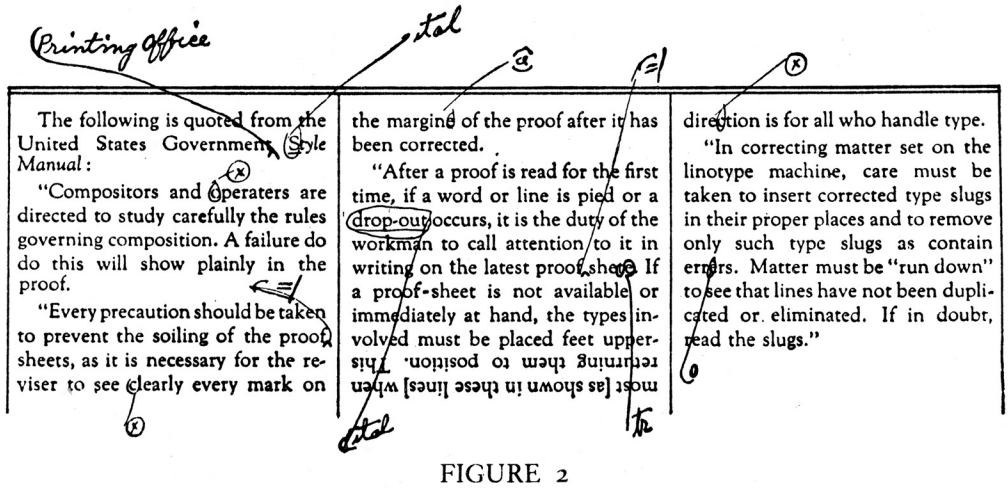
The mark which shows where the last word on the proof is in the copy.

Correct and Incorrect Use of Guide Lines

The use of guide lines should be limited to matter having narrow margins, or to proofs of several columns of text matter, as the page of a magazine or newspaper, where there are margins only alongside the outer columns.

The manner in which correction marks are made on a proof is an element of considerable importance. Neatness and clearness in marking are almost as important as finding the errors. Straggling, unsymmetrical characters, disconnected signs placed in the margins above or below the lines to which they belong, large or indistinct marks, made with a blunt pencil, are faults that should be avoided. Proof-marks are of little use

unless they convey an intelligent idea to the compositor who has to make the corrections in the type. In reading proof of tabular matter, the reader should take advantage of white space as near as possible to


Printing office

The following is quoted from the United States Government Style Manual:

"Compositors and operaters are directed to study carefully the rules governing composition. A failure do do this will show plainly in the proof.

"Every precaution should be taken to prevent the soiling of the proof sheets, as it is necessary for the reviser to see clearly every mark on the margine of the proof after it has been corrected.

"After a proof is read for the first time, if a word or line is pied or a drop-out occurs, it is the duty of the workman to call attention to it in writing on the latest proof sheet. If a proof-sheet is not available or immediately at hand, the types involved must be placed feet upper-most [as shown in these lines] when returning them to position. This direction is for all who handle type.

"In correcting matter set on the linotype machine, care must be taken to insert corrected type slugs in their proper places and to remove only such type slugs as contain errors. Matter must be "run down" to see that lines have not been duplicated or eliminated. If in doubt, read the slugs."

FIGURE 2

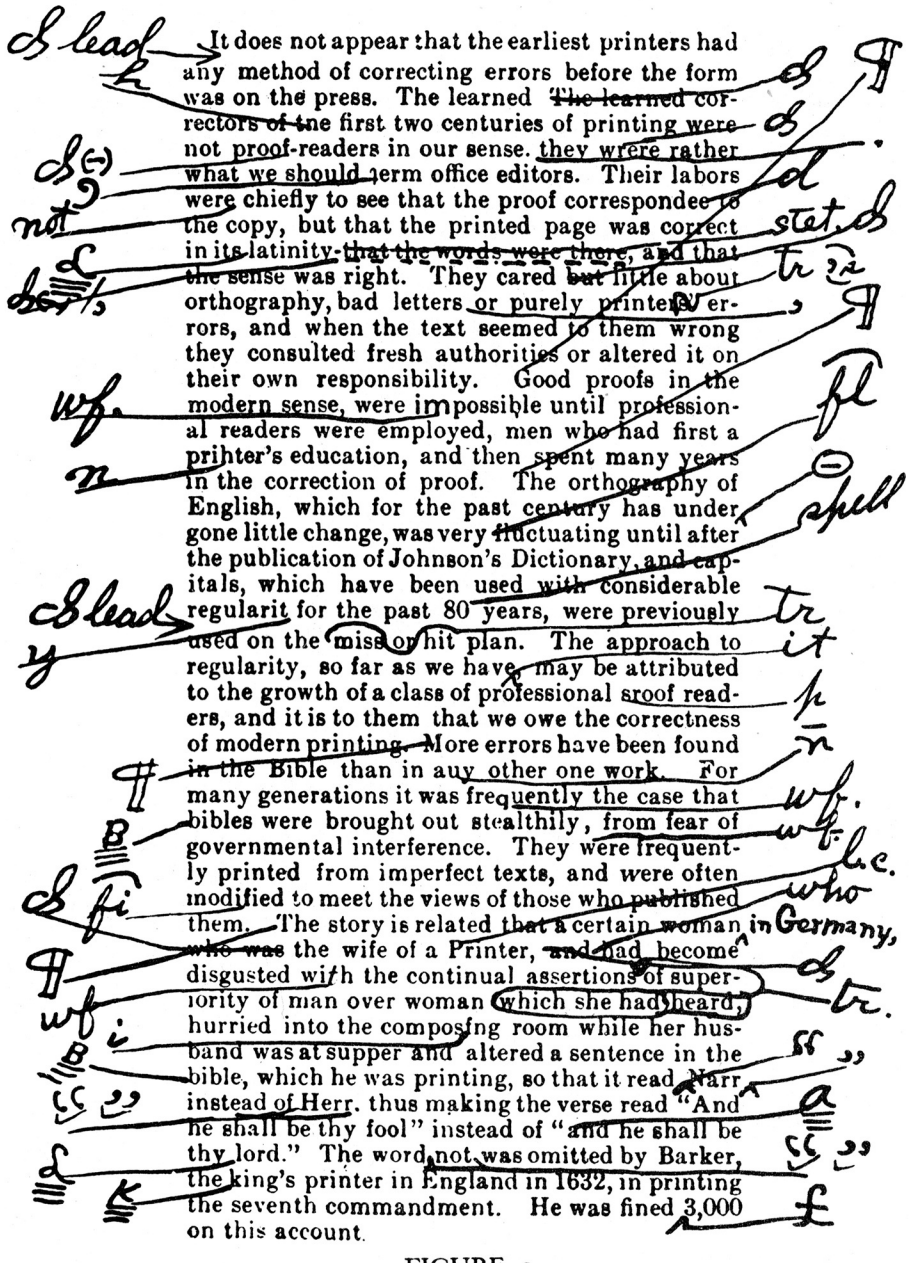
Showing a permissible use of guide lines.

the error and place the correction therein, thus facilitating the work of the person who has to handle the proof afterward. In some kinds of tabular matter, guide lines are required.

Method of Marking Proofs

After the student has familiarized himself with the marks or symbols used by proofreaders, the writing-tool used for making these marks is of relatively slight importance. They may be made with either pen and ink or lead pencil, but the changes should be indicated clearly. The best method, in the opinion of the author, is to write the correction exactly in line with the marked error, as shown in the illustrations on the accompanying pages, and always in the left-hand margin for the first half of the line, in the right-hand margin for the second half. Proofs so marked are more easily corrected than when guide lines are drawn from the mistakes in the type to the margins. If a proof contained but few errors, these lines may be easily understood, but where there are several errors within a short paragraph, lines running out in all directions are exceedingly confusing, and it requires considerable time to discover just where the corrections are to be made. On type-setting machines where copy-holders are used and where only a small section of the proof is visible at one time, the corrections should be marked in small characters in both margins. The drawing of lines to the margins would here be especially objectionable.

The proof, with the corrections and the proofreader's name or initials at the top or bottom of the sheet, is returned to the compositor, who proceeds to make the corrections in the metal.



It does not appear that the earliest printers had any method of correcting errors before the form was on the press. The learned ~~The learned correctors of the~~ first two centuries of printing were not proof-readers in our sense. they wrere rather what we should term office editors. Their labors were chiefly to see that the proof correspondee to the copy, but that the printed page was correct in its latinity, ~~that the words were there, and that the sense was right.~~ They cared ~~but~~ little about orthography, bad letters or purely printers errors, and when the text seemed to them wrong they consulted fresh authorities or altered it on their own responsibility. Good proofs in the modern sense, were impossible until professional readers were employed, men who had first a prihter's education, and then spent many years in the correction of proof. The orthography of English, which for the past century has undergone little change, was very ~~fluctuating~~ until after the publication of Johnson's Dictionary, and capitals, which have been used with considerable regularit for the past 80 years, were previously used on the miss or hit plan. The approach to regularity, so far as we have, may be attributed to the growth of a class of professional sroof readers, and it is to them that we owe the correctness of modern printing. More errors have been found ~~in the Bible~~ than in auy other one work. For many generations it was frequently the case that bibles were brought out stealthily, from fear of governmental interference. They were frequently printed from imperfect texts, and were often modified to meet the views of those who published them. The story is related that a certain woman in Germany, ~~who was~~ the wife of a Printer, ~~and had~~ become disgusted with the continual assertions of superiority of man over woman which she had heard, hurried into the composing room while her husband was at supper and altered a sentence in the bible, which he was printing, so that it read Narr instead of Herr. thus making the verse read "And he shall be thy fool" instead of "and he shall be thy lord." The word not was omitted by Barker, the king's printer in England in 1632, in printing the seventh commandment. He was fined 3,000 on this account.

FIGURE 3

A marked proof, showing incorrect use of guide lines.

Development of and Variations in Proof-Marks

Although a standardized system of proofreaders' symbols would be very desirable, it would probably not receive universal support. Slight

differences of opinion, and long-standing practice of making marks in various ways in different shops—or by different readers in the same shops—would prevent uniformity. Like individual handwriting, proofreaders' marks will always be variable in shape and size. The present-day differences in the marks are not very great, as can be seen from a comparison of the symbols shown in Figure 4 (which is by the author), and in Figure 6, which is by a veteran proofreader on the Boston *Herald,* Mr. Malcolm D. Knock. Now compare these with Figure 10, a reproduction from a modern German textbook, shown by courtesy of the Oscar Brandstetter Company of Leipzig.

If we compare present-day marks with the earliest known corrector's symbols, and then successively with the specimens of the sixteenth, seventeenth, and eighteenth centuries, we will notice a pronounced difference in some of the symbols, but only a slight difference in others.

In Figure 7 we have some of the earliest known correctors' symbols —a page from a Latin book, entitled *Vita Katherinae* (Life of St. Katherine). This volume was printed in 1483, and is preserved in the Gutenberg Museum at Mainz.

It should be recalled here that when printing from movable type was first practiced in Germany, there were no regular proofreaders, and consequently early books contain many errors. It was not uncommon, and in some sections even customary, to mark all corrections that were not made in the proofs in the margins of the printed pages, before or after they were bound into books.

Figure 8 shows symbols of about a hundred years later than those of Figure 7. This specimen, which is in Flemish, and is apparently a treatise on legal documents, is a page, with corrections marked, from one of Plantin's editions of 1577, which is preserved in the Plantin Moretus Museum at Antwerp. With a few exceptions these marks are practically like those which we use today. Christophé Plantin was a Frenchman, who was born about 1520 at Saint Avertin, near the city of Tours, and died in 1589 in Antwerp. After having received instruction under Mr. Robert Mace, the king's printer at Caen, he went to Antwerp, where he first engaged in bookbinding. In 1555 he began printing, and later became the best-known printer and typographer of the Low Countries. His most important production was the famous polyglot edition of the Bible, in eight volumes (printed under the patronage of Philip II of Spain). It is a curious interlineary work in four languages—Hebrew, Latin, Greek, and Chaldaic.

The explanation of the corrections marked in the proof shown in Figure 4 is as follows: *that* instead of *which; y* instead of *i;* insert *e* in

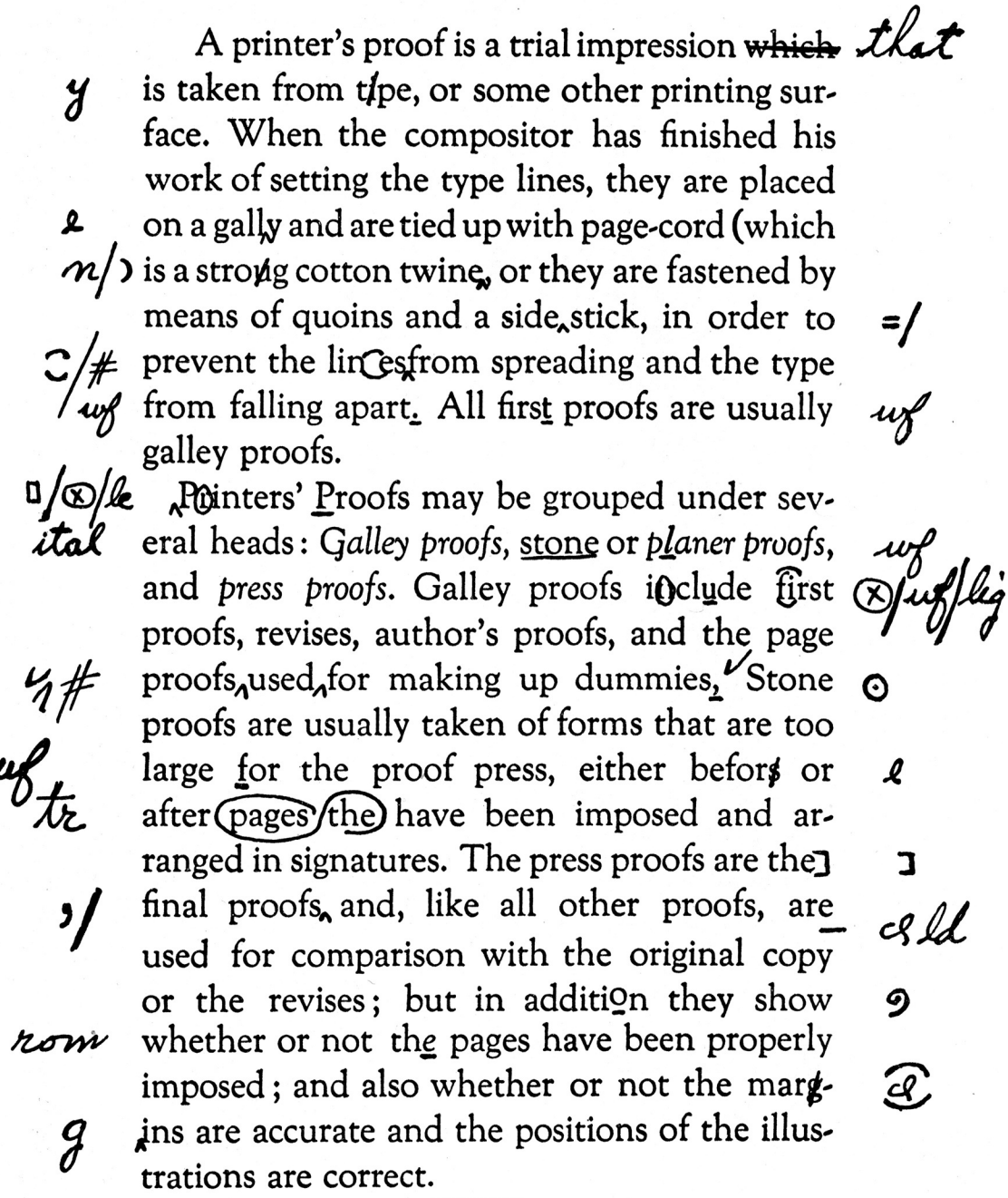


FIGURE 4

A proof showing reader's marks.

galley; *n* in strong; *parenthesis* between e in twine and the comma; *hyphen* between side and stick; close up word, put space between s and f; change *wf* period and letter; change *broken letter* and spell proofs with *lc p; stone* should be italicized; *l* is a *wf* letter; change broken letter *n;*

u is *wf; fi* should be a *ligature;* equalize *space* between words; *period* instead of comma; *e* should take place of *s* in before; transpose *pages*

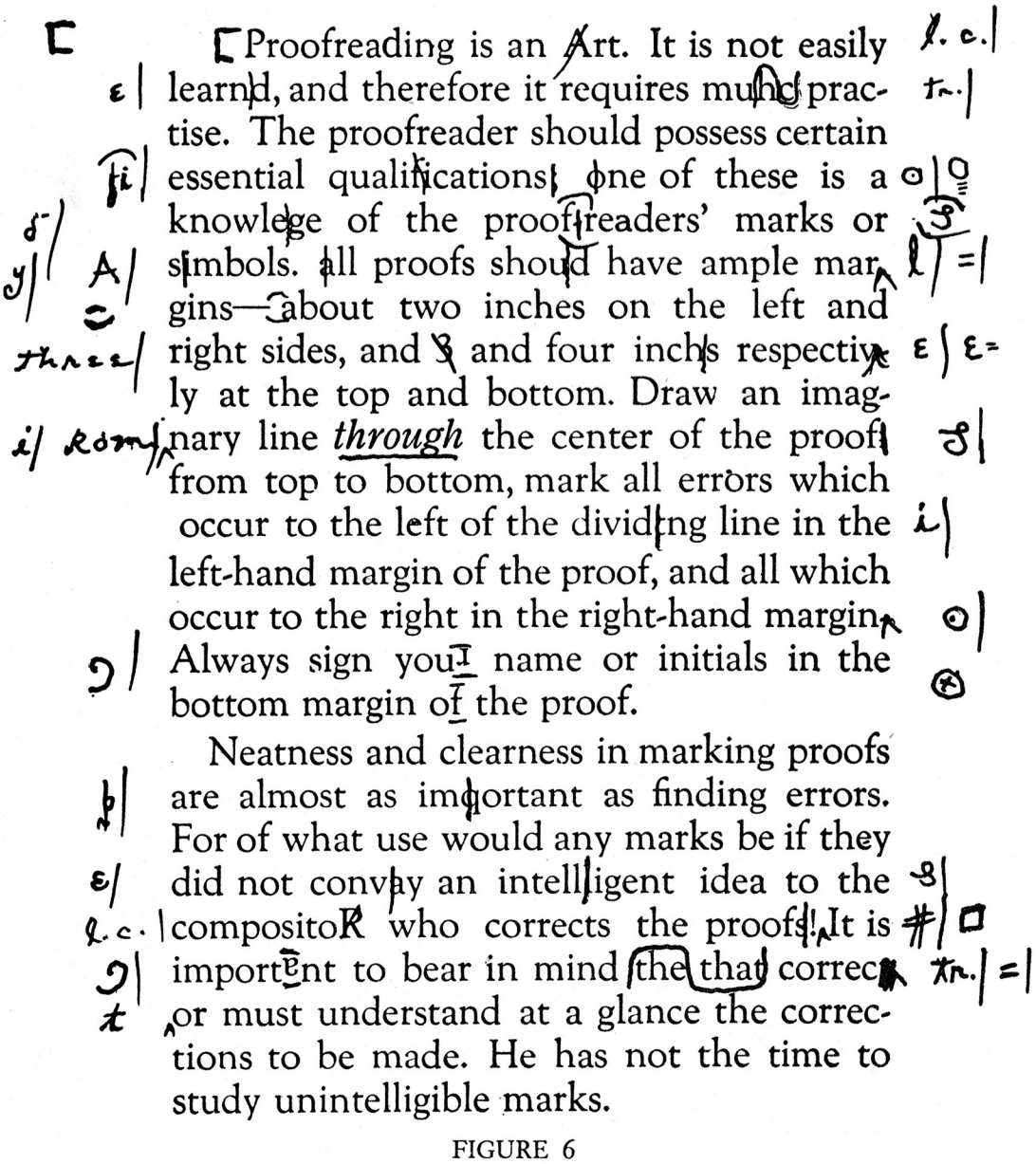
A printer's proof is a trial impression that is taken from type, or some other printing surface. When the compositor has finished his work of setting the type lines, they are placed on a galley and are tied up with page-cord (which is a strong cotton twine), or they are fastened by means of quoins and a side-stick, in order to prevent the lines from spreading and the type from falling apart. All first proofs are usually galley proofs.

Printers' proofs may be grouped under several heads: *Galley proofs, stone* or *planer proofs,* and *press proofs.* Galley proofs include first proofs, revises, author's proofs, and the page proofs used for making up dummies. Stone proofs are usually taken of forms that are too large for the proof press, either before or after the pages have been imposed and arranged in signatures. The press proofs are the final proofs, and like all other proofs, are used for comparison with the original copy or the revises; but in addition they show whether or not the pages have been properly imposed; and also whether or not the margins are accurate and the positions of the illustrations are correct.

FIGURE 5

A revise, taken after all the corrections marked in Figure 4 have been made in the type.

and *the;* take away indention after *the; comma* after proofs; take out extra lead between lines; turn *o* right-side up; change italic *e* to roman e; margins is correctly divided *mar-gins.*


Proofreading is an Art. It is not easily learnd, and therefore it requires much practise. The proofreader should possess certain essential qualifications; one of these is a knowledge of the proof-readers' marks or symbols. All proofs should have ample margins—about two inches on the left and right sides, and three and four inches respectively at the top and bottom. Draw an imaginary line *through* the center of the proof from top to bottom, mark all errors which occur to the left of the dividing line in the left-hand margin of the proof, and all which occur to the right in the right-hand margin. Always sign your name or initials in the bottom margin of the proof.

Neatness and clearness in marking proofs are almost as important as finding errors. For of what use would any marks be if they did not convey an intelligent idea to the compositor who corrects the proofs! It is important to bear in mind that the corrector must understand at a glance the corrections to be made. He has not the time to study unintelligible marks.

FIGURE 6

Another specimen of marked proof.

Further development and changes in proof symbols may be seen in Figure 9, which shows three pages from a German book on proofreaders' marks and their use, by Christian F. Gessner, printed in 1740. The volume is in the Typographic Library of the American Type Founders Company, at Jersey City.

The Revise

After all corrections have been made by the compositor, another proof is taken. This one is called a *revise*. It is sent to the proofreader

along with the first proof. The proofreader compares the revise with the first proof, and if the corrections have not all been made, they are marked on the revise and it is given to the compositor. If they have all been properly made, the first proof and the revise are returned to the compositor or the foreman with the marks "O. K." on the revise. Some-

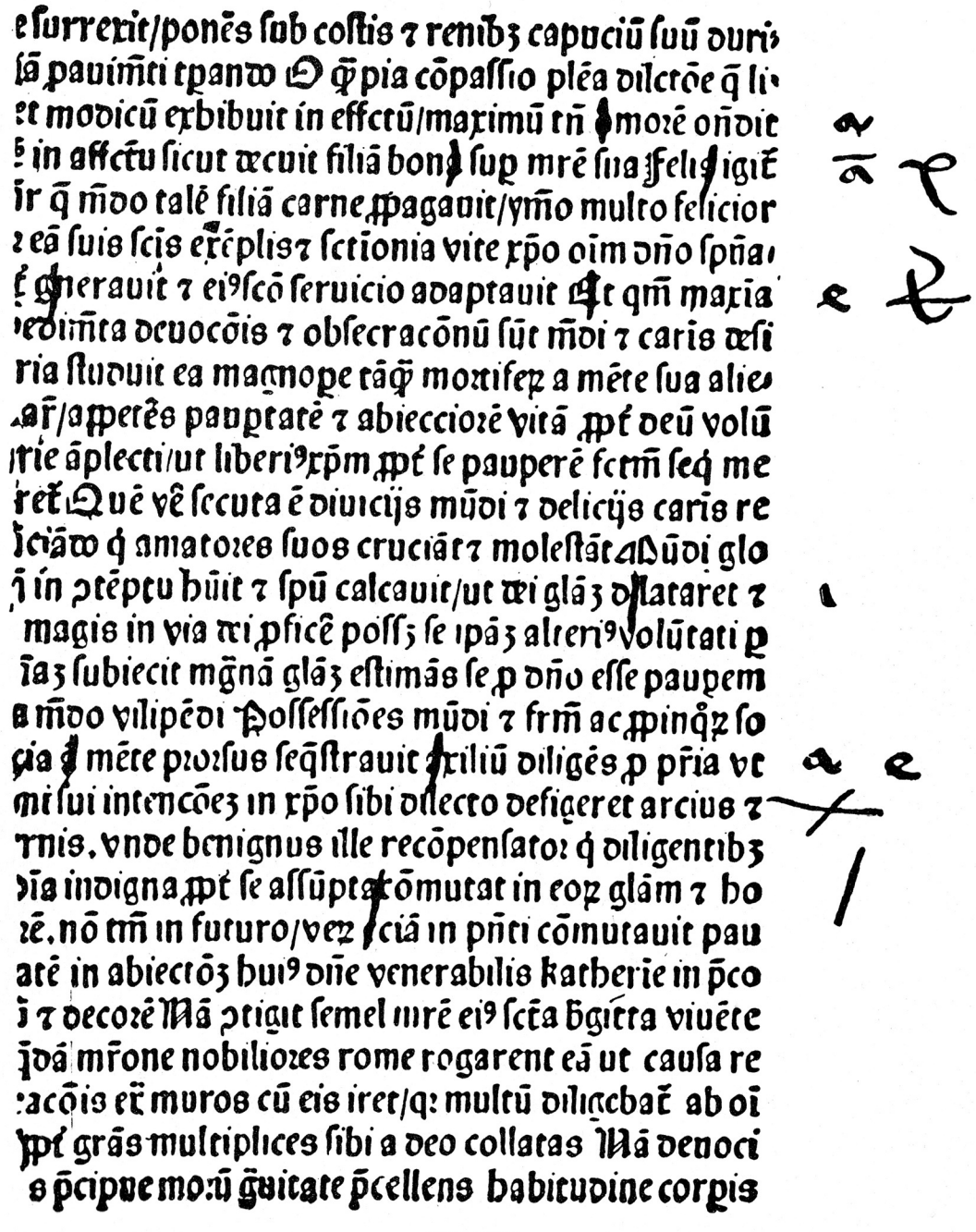


FIGURE 7

A page from the book, *Vita Katherinae*, printed in 1483, showing some of the earliest correctors' symbols in existence.

times the revise or the first proof will be found to be marked "O. K. with corrections." This is done when there are only a few unimportant errors in the first proof or the revise and it is not desired to take another proof (revise) or second revise. "O. K., pass up," means to pass the galley on to the stoneman, or to its proper place in the cabinet or galley rack.

In book-printing houses two or more sets of clean proofs are sent to the author, and one of these is returned by him with his corrections, or changes, if he desires to make any. After the author's proofs have been "O.K.'d," the type is made up into pages of the required length and the *headings, page numbers, foot-notes,* etc., are added, and two sets of these proofs, which are called *page-proofs,* are sent to the author for final inspection and for pasting into a *dummy,* which is a pamphlet or book about the size that the finished work is to be, showing the blank pages, title page, running title, sub-title, copyright page, etc. The procedure of handling proofs varies somewhat in different shops.

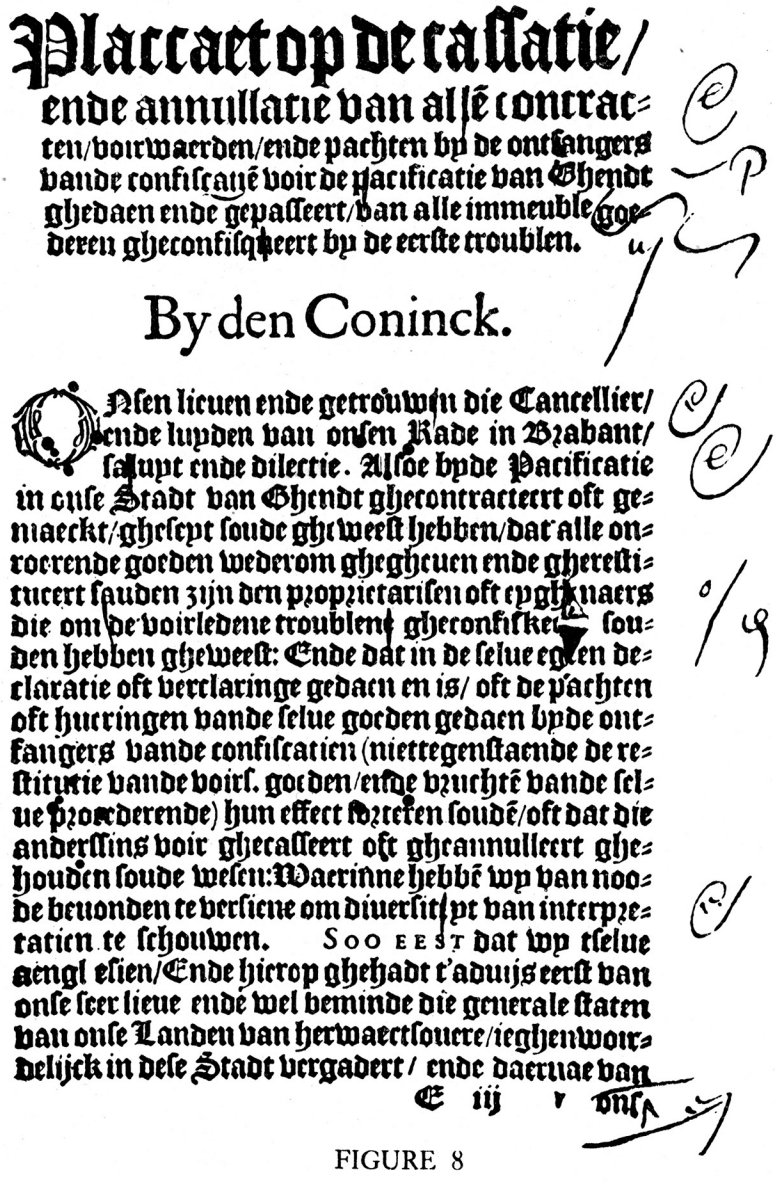
Foundry Proofs

Pages may need revision and other proofs at this stage; or if they are to be electrotyped, guard lines are placed around each page and they are locked in foundry chases, and *foundry proofs* are pulled. Foundry proofs should always be sent with all pages that are to be electrotyped. These are for record or reference in case a letter or words drop out or the page is pied while the mold is being made, and for comparison after the plate has been made and finished.

Form Proofs

The *form proofs* are taken when the pages are imposed and locked up in the chase, ready for the press. At this stage the form of eight, twelve, sixteen, or more pages is too large for a proof press, and in order to avoid loss of time on the cylinder printing press, while waiting for final revision, a proof is frequently taken by beating with the proof planer. This proof is also called a *stone proof.* Electrotypes, which are nowadays rarely mounted on blocks by the electrotyper, but are sent to the printer unmounted, with beveled edges, to be screwed or clamped to metal bases or blocks, cannot be proved on the stone. They must be proved on a press. This is done by placing a metal slab, exactly the required height, on the bed of the proof press and one or more electrotype pages are laid on it loosely, inked and proved. Frequently the electrotyper sends a set of proofs with the electrotypes to the printer.

The explanation of the marks in Figure 8 are as follows: Second line from top, *change bad letter;* fourth line, *insert capital P* in pacificatie; fifth line, *line up letters* goe-; sixth line, *insert u;* eighth line, *change bad letter;* tenth, *take out letter and close up;* fourteenth, *insert o;* fifteenth, *delete e;* twenty-fourth, *change bad letter;* last line, *insert hyphen.*



Placcaet op de caſſatie/
ende annullatie van alſẽ contracten/voirwaerden/ende pachten by de ontfangers vande confiſcatiẽ voir de pacificatie van Ghendt ghedaen ende gepaſſeert/van alle immeuble goederen gheconfiſqueert by de eerſte troublen.

By den Coninck.

ONſen lieuen ende getrouwen die Cancellier/ ende luyden van onſen Rade in Brabant/ ſalupt ende dilectie. Alſoe bynde Pacificatie in onſe Stadt van Ghendt ghecontracteert oft gemaeckt/ghelept ſoude ghe weeſt hebben/dat alle onroerende goeden wederom ghegheuen ende gherestituert ſauden zijn den proprietariſen oft eygenaers die om de voirledene troublen gheconfiſkeert ſouden hebben ghe weeſt: Ende dat in de ſelue eygen declaratie oft verclaringe gedaen en is/ oft de pachten oft huerringen vande ſelue goeden gedaen bynde ontfangers vande confiſcatien (niettegenſtaende de reſtitutie vande voirſ. goeden/ende bruchtẽ vande ſelue procederende) hun effect houden ſoudẽ/oft dat die anderſins voir gheualleert oft gheannulleert gehouden ſoude weſen: Waerinne hebbẽ wy van noode bevonden te verſiene om diuerſitept van interpretatien te ſchouwen. SOO EEST dat wy tſelue aengl eſien/Ende hierop ghehadt t'aduijs eerſt van onſe ſeer lieue endé wel beminde die generale ſtaten van onſe Landen van herwaertſouere/ieghenwoordelijck in deſe Stadt vergadert/ ende daernae van

FIGURE 8
Corrected page
from a Plantin edition of 1577.

SHEET PRESS PROOFS

The first *sheet proofs* which are printed after the chase is locked on the bed of the printing press are sent to the proofreader for revision and

comparison. If any new errors are found, or if the corrections in any page that has been electrotyped have not been accurately made, the particular page must be taken out and sent to the electrotyper for correction. If the form is composed of type pages, minor corrections can be made without removing the type from the bed of the press. Press corrections usually cause a serious delay, and increase the ultimate cost of the book that is being printed. Such errors or oversights are usually due to carelessness of some person in the printshop or in the proofroom. The importance of care in correcting proofs of all kinds can not be overestimated.

Observations on Proofreading

The proofreader is generally a printer of mature experience, but the copyholder may be an apprentice who has served two or three years of his time. Occasionally the proofreader may be an apprentice, but in that case the copyholder should be a journeyman or an experienced reader. There are many good proofreaders and copyholders who have never learned the printers' trade, but the tendency of the times favors using practical printers as proofreaders, because they can detect the errors most readily and possess a "typographic eye." This, of course, is only true in case their general education and vision are as good as that of the non-printer proofreaders.

The procedure of reading proof in some offices is as follows: The copyholder, having arranged the copy and proofs, passes the first proof to the reader. The copyholder, who sits near the proofreader—so near that by bending over the reader may look at a doubtful word in the copy, or at least so near that he can take the sheet from the copyholder's hand—begins reading at a moderate rate of speed and continues doing so until the galley is finished. When the proofreader says "Hold," he stops; when he says "Go on," he does so; when he is told "Read that again," "Spell that name," or "Read that paragraph again," he does so. Copyholders usually do not read rhetorically, but rather like machines, without emphasis and without discrimination. The well-trained copyholder will spell out all unusual foreign and geographical words and proper nouns which have two or more orthographies, and when there is any doubt the proofreader himself will look so as to make certain that he is making no mistake. Frequently he must consult a dictionary or reference book.

The proofreader should also see that the lines of the type are properly spaced. "Rivers of white," or "pigeonholes" or "staircases," as they were called by old readers, should be avoided. They are occasioned by

spacing words too widely, thus forming regular steps up and down from one line to the next. Three hyphens, or other marks of punctuation, one after the other, at the end of lines should be avoided; but not if good spacing must be sacrificed.

Some proofreaders, before they begin reading, first glance over the proof and line up the paragraphs, to see if all paragraphs are correctly and uniformly indented.

After the proof has been read, the reader should verify the divisions of all words that are divided at the ends of lines, unless this has already been done during the reading. He should also make sure that the remainder of each divided word is placed at the beginning of the following line.

If matter contains headings and subheads, these should be gone over and checked to see that they are correct; that their position is right, and that the size and style of type are as ordered or as marked on the original copy.

All proofs, whether galley proofs or revises, should bear the name or initials of the reader. This signature is usually placed in the upper or lower right-hand margin of the proof.

The *Style Book* of the Government Printing Office at Washington contains the following instructions to proofreaders:

"The importance of revising galley proofs can not be overestimated. While a reviser is not expected to read proof, it is not enough for him to slavishly follow the marks found on the proof sheet. He should see that all corrections have been properly made in the type, that words or lines have not been transposed by the compositor in making the corrections, and that the rules governing spacing, division of words, and good printing generally have been observed. The reader or reviser who passes bad spacing will be held at fault.

"A reviser must not remodel the punctuation of the readers or make any important changes in the work. If he thinks that an important change should be made, he should submit the proposed change to the foreman for decision.

"All instructions on first proofs must, in every instance, be transferred to revised sheets, whether galley revise, page proof, stone revise, or press revise. All queries made by readers must be carefully transferred to the revises.

"Every paragraph in a proof containing an alteration which makes one or more overruns necessary should be re-read as first proof.

"Revising should be done with reasonable despatch, but good work must not be sacrificed to haste.

"The slug number of the corrector must be carried on the revises if the errors are made by him.

"Press, stone, and foundry revises are equally important. With the latter special care must be taken that rules do not lap, that work is not jammed in the 'lock-up,' that damaged letters are indicated, and that the matter is ready in all respects to pass severe criticism."

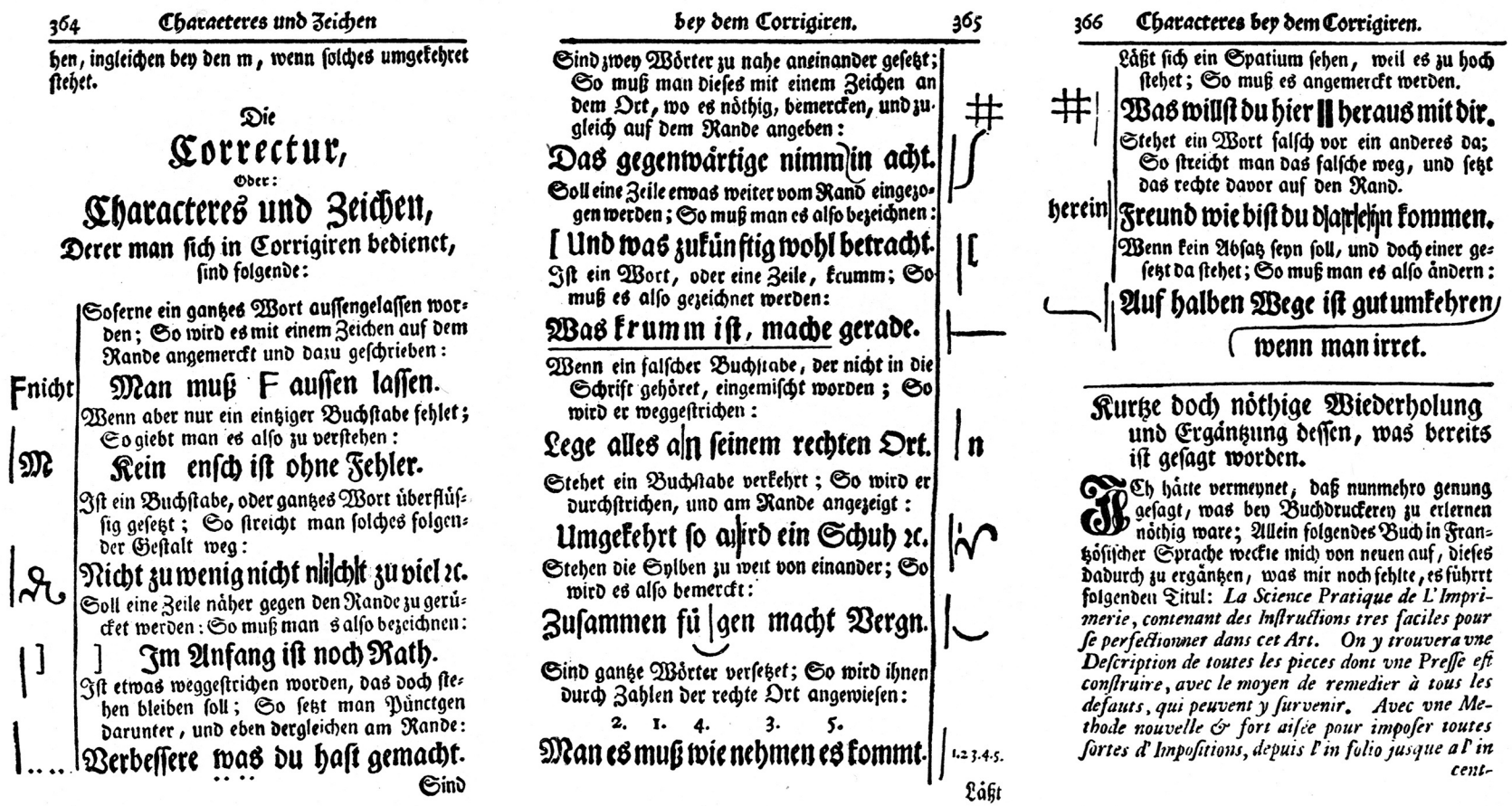
In the United States Government proofroom, on all important work, two readers and a referee are employed. The first reader marks in black pencil; the second in blue; the third, or referee, marks in red ink. Both the first and second readers have copyholders who hold the copy while the readers read aloud and mark the proofs. The referee does not use a copyholder, but the marked proofs and the copy are passed to him for final checking-up.

Some large book-printing offices have established the practice of having all copy carefully prepared by a proofreader before it is given to the compositor. If such a practice were made universal there would, no doubt, be fewer errors in the first proofs of matter placed in type. The proofreader having in charge the preparation of copy for the compositors should never change the author's wording in any way unless he has authority to do so; but almost invariably there are matters of greater or less importance which need correction, which rarely get it from the compositors. The compositor or operator of a type-setting machine has seldom the authority to make changes in an author's copy, even though such changes are, in his opinion, necessary and in conformity with good usage of the rules of grammar and punctuation.

Theodore Low DeVinne, who was one of the greatest American master-printers, says in his book, *Correct Composition:*

"When the proofreader meets with an unmistakable fault made by the writer (author) through lapse of memory or by negligence, he should correct it. He does so, however, at some peril. He must know, and not suspect, it to be an error, and must be prepared to defend his correction, not by his own belief, but by unquestionable authority."

The duty of the proofreader is primarily that of reading proofs in order to eliminate errors. When handling unimportant work, as is the case frequently on newspapers, the readers read alone without the assistance of a copyholder. Copyholders usually are apprentices, and, of course, cannot be expected to possess the knowledge and experience that proofreaders are supposed to have. It is therefore inadvisable to entrust them with important proofs or even with revising of first proofs, as for the most part they are not well qualified for such work.



364 Characteres und Zeichen

hen, ingleichen bey den m, wenn ſolches umgekehret ſtehet.

Die
Correctur,
Oder:
Characteres und Zeichen,
Derer man ſich in Corrigiren bedienet, ſind folgende:

Soferne ein gantzes Wort auſſengelaſſen worden; So wird es mit einem Zeichen auf dem Rande angemerckt und darzu geſchrieben:

Fnicht Man muß F auſſen laſſen.

Wenn aber nur ein eintziger Buchſtabe fehlet; So giebt man es alſo zu verſtehen:

M Kein enſch iſt ohne Fehler.

Iſt ein Buchſtabe, oder gantzes Wort überflüſſig geſetzt; So ſtreicht man ſolches folgender Geſtalt weg:

Nicht zu wenig nicht nicht zu viel ꝛc.

Soll eine Zeile näher gegen den Rande zu gerücket werden: So muß man s alſo bezeichnen:

]] Im Anfang iſt noch Rath.

Iſt etwas weggeſtrichen worden, das doch ſtehen bleiben ſoll; So ſetzt man Pünctgen darunter, und eben dergleichen am Rande:

Verbeſſere was du haſt gemacht.

Sind

bey dem Corrigiren. 365

Sind zwey Wörter zu nahe aneinander geſetzt; So muß man dieſes mit einem Zeichen an dem Ort, wo es nöthig, bemercken, und zugleich auf dem Rande angeben:

Das gegenwärtige nimm in acht.

Soll eine Zeile etwas weiter vom Rand eingezogen werden; So muß man es alſo bezeichnen:

[Und was zukünftig wohl betracht.

Iſt ein Wort, oder eine Zeile, krumm; So muß es alſo gezeichnet werden:

Was krumm iſt, mache gerade.

Wenn ein falſcher Buchſtabe, der nicht in die Schrift gehöret, eingemiſcht worden; So wird er weggeſtrichen:

Lege alles a n ſeinem rechten Ort.

Stehet ein Buchſtabe verkehrt; So wird er durchſtrichen, und am Rande angezeigt:

Umgekehrt ſo a ird ein Schuh ꝛc.

Stehen die Sylben zu weit von einander; So wird es alſo bemerckt:

Zuſammen fü gen macht Vergn.

Sind gantze Wörter verſetzet; So wird ihnen durch Zahlen der rechte Ort angewieſen:

2. 1. 4. 3. 5.
Man es muß wie nehmen es kommt.
1.2.3.4.5.

Läßt

366 Characteres bey dem Corrigiren.

Läßt ſich ein Spatium ſehen, weil es zu hoch ſtehet; So muß es angemerckt werden.

Was willſt du hier heraus mit dir.

Stehet ein Wort falſch vor ein anderes da; So ſtreicht man das falſche weg, und ſetzt das rechte davor auf den Rand.

herein Freund wie biſt du da ſo kommen.

Wenn kein Abſatz ſeyn ſoll, und doch einer geſetzt da ſtehet; So muß man es alſo ändern:

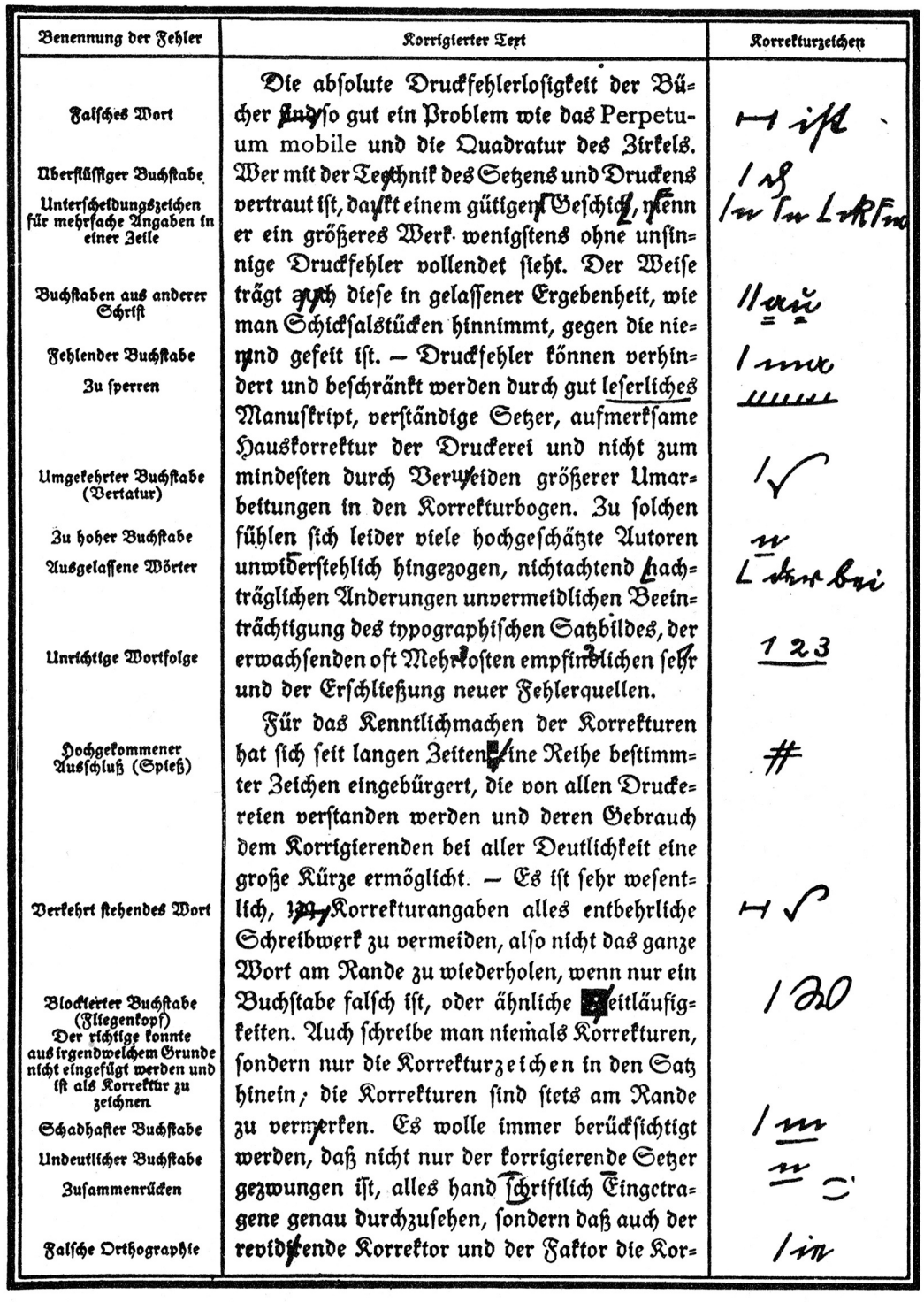
Auf halben Wege iſt gut umkehren,
wenn man irret.

Kurtze doch nöthige Wiederholung und Ergäntzung deſſen, was bereits iſt geſagt worden.

Ich hätte vermeynet, daß nunmehro genung geſagt, was bey Buchdruckerey zu erlernen nöthig ware; Allein folgendes Buch in Frantzöſiſcher Sprache weckte mich von neuen auf, dieſes dadurch zu ergäntzen, was mir noch fehlte, es führrt folgenden Titul: *La Science Pratique de L'Imprimerie, contenant des Inſtructions tres faciles pour ſe perfectionner dans cet Art. On y trouvera vne Deſcription de toutes les pieces dont vne Preſſe eſt conſtruire, avec le moyen de remedier à tous les defauts, qui peuvent y ſurvenir. Avec vne Methode nouvelle & fort aiſée pour impoſer toutes ſortes d'Impoſitions, depuis l'in folio jusque a l'in cent-*

FIGURE 9

Three pages from a German book by Christian F. Gessner, dated 1740, now in the Typographic Library of the American Type Founders Company at New Jersey.



Benennung der Fehler	Korrigierter Text	Korrekturzeichen
Falsches Wort	Die absolute Druckfehlerlosigkeit der Bücher ist so gut ein Problem wie das Perpetuum mobile und die Quadratur des Zirkels.	
Überflüssiger Buchstabe	Wer mit der Technik des Setzens und Druckens	
Unterscheidungszeichen für mehrfache Angaben in einer Zeile	vertraut ist, dankt einem gütigen Geschick, wenn	
Buchstaben aus anderer Schrift	er ein größeres Werk wenigstens ohne unsinnige Druckfehler vollendet sieht. Der Weise	
Fehlender Buchstabe	trägt auch diese in gelassener Ergebenheit, wie	
Zu sperren	man Schicksalstücken hinnimmt, gegen die niemand gefeit ist. – Druckfehler können verhindert und beschränkt werden durch gut leserliches	
Umgekehrter Buchstabe (Vertatur)	Manuskript, verständige Setzer, aufmerksame	
Zu hoher Buchstabe	Hauskorrektur der Druckerei und nicht zum	
Ausgelassene Wörter	mindesten durch Vermeiden größerer Umarbeitungen in den Korrekturbogen. Zu solchen	
Unrichtige Wortfolge	fühlen sich leider viele hochgeschätzte Autoren	
Hochgekommener Ausschluß (Spieß)	unwiderstehlich hingezogen, nichtachtend nachträglichen Änderungen unvermeidlichen Beeinträchtigung des typographischen Satzbildes, der	
Verkehrt stehendes Wort	erwachsenden oft Mehrkosten empfindlichen sehr und der Erschließung neuer Fehlerquellen.	
Blockierter Buchstabe (Fliegenkopf)	Für das Kenntlichmachen der Korrekturen	
Der richtige konnte aus irgendwelchem Grunde nicht eingefügt werden und ist als Korrektur zu zeichnen	hat sich seit langen Zeiten eine Reihe bestimmter Zeichen eingebürgert, die von allen Druckereien verstanden werden und deren Gebrauch	
Schadhafter Buchstabe	dem Korrigierenden bei aller Deutlichkeit eine	
Undeutlicher Buchstabe	große Kürze ermöglicht. – Es ist sehr wesent-	
Zusammenrücken	lich, in Korrekturangaben alles entbehrliche	
Falsche Orthographie	Schreibwerk zu vermeiden, also nicht das ganze Wort am Rande zu wiederholen, wenn nur ein Buchstabe falsch ist, oder ähnliche Weitläufigkeiten. Auch schreibe man niemals Korrekturen, sondern nur die Korrekturzeichen in den Satz hinein; die Korrekturen sind stets am Rande zu vermerken. Es wolle immer berücksichtigt werden, daß nicht nur der korrigierende Setzer gezwungen ist, alles handschriftlich Eingetragene genau durchzusehen, sondern daß auch der revidierende Korrektor und der Faktor die Kor-	

FIGURE 10

Corrector's marks *(Korrekturenzeichen)* in German.

The explanation of the marks of Figure 10 appears in first column. Translation of these is, beginning at top: *wrong word; superfluous let-*

ter; differential diagonal strokes for different errors in the same line; wrong-font letters; missing letter; to be letter-spaced; letter upside down, invert; high letter (prints bold); *words omitted; words transposed; rising space* (push down); *word upside down; letter turned for lack of sorts; broken letter; take out space and close up; faulty orthography* (misspelled word).

The reading of proofs containing many foreign words or phrases, difficult dialect, and medical terms should be done with an experienced copyholder, who should be required to spell out all unusual words. If,

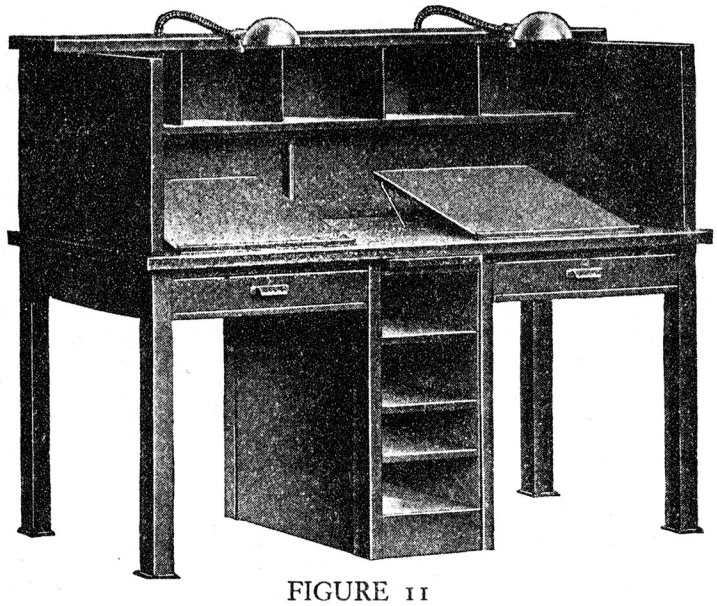


FIGURE 11

A proofreader's desk, with two reading-boards, and compartments for copy and proofs.

however, it becomes necessary to read such matter alone, the reader should *collate* it—compare word for word in copy and proof.

Some correctors of the press, and copyholders also, place a guide-rule or line gage across the copy or proof just below the line which they are reading. This aids them in following the text rapidly down from line to line to the end.

Copy Marking

The persons employed in the technical planning division of a large publishing house, or the editors of manuscript, have a copy-marking system that dates back for many years. The system is a very simple one, and consists of underscoring of words or phrases, and the like, in order to indicate to the compositor the kind of letters to be used for headings,

as center-heads, side-heads, sub-heads, and to indicate where capitals, small capitals, italics, etc., are to be used within the text of a manuscript. The following are the principal markings:

One line ——— under a word signifies that it is to be set in *italics*.

Two lines ═══ under a word signify that it is to be set in SMALL CAPITALS.

Three lines ≡≡≡ indicate that the word is to be in CAPITALS.

Three lines ≡ ═══ under the initial letter of a word and two lines under its remaining letters signify that it is to be set as CAPITAL and SMALL CAPITALS.

One wavy line ~~~ is used for a word to be set in **Bold-face** type.

CHAPTER XII

THE POINT SYSTEM OF MEASUREMENT

The printer uses, in addition to the linear measurement, a special system, called the *point system*. The point system is a method of type measurement based on a unit called a pica, which is equivalent to twelve points; a point is about 1/72 inch in thickness. The pica is the standard of measurement in the printing trade. The American standard inch contains approximately 6 picas, or 72 points. Every kind of material used by the compositor, when cast or cut on the point system, from any type foundry using this system, may be interchangeably used. The point system is a precise, orderly method, and it enters into many calculations in printers' arithmetic, and every justification in working with printers' types and materials.

The standard printers' measure is as follows: One point equals about 1/72 inch; 6 points equal one nonpareil; 12 points equal one pica; 6 picas equal one inch; 72 points equal one inch. These factors are used for all practical purposes. A point is actually equal to the decimal of 0.013837+ inch; therefore, it requires 72.46 points to make an inch. A pica (12 points) is 0.166044 inch.

There is a slight variation between the typographic point of 0.013837+ inch and the Linotype point of 0.014 inch. Some printers claim that this variation causes trouble in justifying foundry type, leads, and slugs, and Linotype slugs together, which may be true while the foundry type and leads are new. Foundry type and leads quickly collect a fine film of dirt during the various operations necessary in printing and electrotyping, which increases its dimensions slightly.

Before the point system came into general use, printers had arbitrary units of measurement, by which they calculated the number of ems set and the wage-value of the composed type; the widths and depths of all composition material, as type, leads, and rules, were cut and measured according to the established unit. In some shops the en quad was used as the basic unit; in others the pica em furnished the basis for computation. We still speak of a particular job or page of type as so many picas wide

and so many picas deep. But while the old-time printers accepted the pica-em unit, it was never standardized; that is to say, each type founder had his own particular unit, and this frequently differed slightly from that of every other type founder. The variation in size was so great that the same "size" from two different founders could not be locked up in the same line without the use of thin strips of paper or wooden plugs. Quads and spaces bought from one founder would not line with type bought from another without the use of paper strips or cardboard.

The pica-em unit was said to be 72 to the foot, or 6 to the inch; but no foundry made it exactly 72 to the foot, and in some cases the 72 ems made 6 points more than a foot, and in some cases they made 6 points less than a foot. This was unsatisfactory for accurate calculations, but it was even worse when two or probably three different sizes of picas were being used in the same room and mixed up in nearly every job that was composed. One of the earliest writers to deplore the arbitrary sizes of type-bodies was Joseph Moxon, in his *Mechanic Exercises.* Slater, in *What a Compositor Should Know,* says:

"As might be expected, every type-body of a smaller dimension than pica differed also, and in every case bore no relation whatever to the accepted unit of measurement. Long primer or 10-point was cast to 89, 90, and 92 ems respectively to the foot; brevier or 8-point was cast to 108.5, 110, 110.75, 111, and 112; pearl or 5-point, 178, 179, 180, 183, 184. It was not at all uncommon for a compositor to find the three long primers and several of the others in the same shop, and the spaces and quads of each of the groups badly mixed up, which made good work and rapid composition almost impossible."

History of the Point System

Although several attempts had been made by type founders, prior to 1878, to improve and change the condition of things already described, no definite results had been obtained. About 150 years previously a French type founder had invented the point idea, and had made it very nearly as perfect as we have it today. This idea was worked out by Pierre Simon Fournier, commonly called *Fournier le jeune.* He thus refers to his invention in the book, *Manuel Typographique,* which he published in 1764:

" 'To clear this chaos and to give to this department of typography an order which never before reigned there, is the subject which has engaged my attention. Through the invention of the *typographic points,* I think that I have been fortunate enough to succeed with an exactness and precision that leave nothing to be desired. The typographic point is nothing more than the

separation of the bodies of types by equal and definite degrees, which I call *points*. . . . With this object in view I have fixed these points of the exact size they should have. . . . I have divided the standard scale into two inches; the inch into twelve lines, and the line into six typographic points; making altogether 144 points in two inches. . . . The invention of these points is the first service that I rendered to typography in 1737.'"

It is not unlikely that the fact that the French and English linear measure equals one foot suggested to Fournier the idea of having 12 points to a pica.

The European typographic point is not quite the same as the American point. Some European type founders use the *Didot* point system, which is based on the metric system of measurement. This point is equal to about 1.07 American points.

Point System in America

Fournier's plan was an excellent one, but it was not adopted by any type founder in America until the year 1878, when the foundry of Marder, Luse & Co., of Chicago, was destroyed by fire. When it was rebuilt, the firm decided to cast all types and materials according to point system measurements. This was the beginning of the point system in America. The United States Type Founders' Association adopted it in 1887. It is the only system in general use in printshops today.

How to Apply the Point System

In actual application and use, the important feature of the point system is that all, or nearly all, types and materials cast according to it are exact multiples of some other types or materials. This feature may be seen to advantage when examining the spaces and quads supplied by foundries. To illustrate, take the sizes of spaces from 6 to 12 points. We know that the 3-to-an-em space is always a third of its em-quad width, and therefore a 3-to-an-em space of 12-point is exactly four points thick, and being four points thick it is exactly equal to an 8-point en space; three 8-point en spaces are equal in width to a 12-point em; and the 3-to-an-em space of 12-point is also equal to two 2-point leads.

Here is a second illustration: A 3-to-an-em space of 6-point is exactly two points thick, and will, when placed on its side, justify with a 2-point lead; a 4-to-an-em space of 8-point is also two points thick, and will justify with a 2-point lead or rule; a 5-to-an-em space of 10-point is also two points thick, and in a like manner will justify exactly with the same size

lead or rule. Finally, while each of these sizes of spaces is equal to the same thickness of lead, rule, or border, they are all equal to one another.

The em is the square of any type-body. An em, unless further qualified, may have any dimension common to type-bodies. A 6-point em is 6 points square; an 8-point em is 8 points square; a 10-point em is 10 points square; a 12-point em (pica) is 12 points square, and so on. The term "em" is said to have its origin in the fact that formerly the lower-case "m" of nearly all body-type faces was cast on a square body having for its dimensions the size of the given body. This is not now the case, and the lower-case "m" may be, but generally is not, of the same dimension as the em quad of the font to which it belongs. The early printers spoke of "m" quads, and not of em quads, as we do now.

Type Computations

After the young compositor learns to set straight-matter body-type accurately, he is curious to know how many hundreds or thousands of types he picks up in an hour or a day. This can be figured by means of the point system. Using the pica em as a basis, a line of type 13 ems wide, set in pica or 12-point size, contains 13 ems; 1000 divided by 13 equals 76 12/13. It requires about 77 lines to make 1000 ems; but as not every character in each line is 12 points wide (it is 12 points deep or high) it is necessary to pick up more than 1000 pieces of type in order to set 1000 ems. It is therefore not the number of letters and spaces that are counted in figuring composed type, but the number of em-quad widths in each line or group of lines.

A page of 12-point type, 24 picas (4 inches) wide, and 36 picas (6 inches) deep, would contain 864 ems. To determine this, multiply the number of ems in the width (or length) of the line by the number of lines in the page, as follows: 24 × 36 equals 864 ems.

If the 36 lines are set in 10-point type, the mass (4 by 6 inches) contains a greater number of 10-point ems because these ems have a smaller dimension. To illustrate:

24 × 12 equals 288 points.

288 ÷ 10 equals 28.8 (the number of 10-point ems in a line).

36 × 12 equals 432 points (the number of points in the depth of the page).

432 ÷ 10 equals 43.2.

28.8 × 43.2 equals 1244.16, the number of 10-point ems to the page.
Converted into 8-point ems:
24 × 12 equals 288 points.
288 ÷ 8 equals 36.
36 × 12 equals 432 points.
432 ÷ 8 equals 54.
36 × 54 equals 1944, the number of 8-point ems in a page 4 by 6 inches in size.

A Table of Type Ems

This table shows the approximate number of lines, of different sizes of type, that are required to make 1000 ems, when the lines are from 10 to 36 picas in width.

WIDTH IN PICA EMS	Pica (12-pt.).	Small Pica (11-pt.).	Long Primer (10-pt.).	Bourgeois (9-pt.).	Brevier (8-pt.).	Minion (7-pt.).	Nonpareil (6-pt.).	Agate (5½-pt.).	Pearl (5 pt.).
10	100	91	83	75	67	59	50	46	42
11	91	83	76	68	61	53	46	42	38
12	83	77	70	63	56	49	42	38	35
13	77	70	65	58	51	45	39	35	33
14	71	66	60	54	48	42	36	33	30
15	67	62	56	50	44	39	33	31	28
16	63	57	52	47	42	36	31	29	26
17	59	54	49	44	39	34	29	27	25
18	56	51	46	42	37	32	28	25	23
19	53	49	44	40	35	31	26	24	22
20	50	46	42	38	33	29	25	23	21
21	48	44	40	36	32	28	24	22	20
22	45	42	38	34	30	26	23	21	19
23	44	40	36	32	29	25	22	20	18
24	42	39	35	31	28	24	21	19	17
25	40	37	33	30	27	23	20	18	17
26	39	35	32	29	26	23	19	18	16
27	37	34	31	28	25	22	18	17	16
28	36	33	30	27	24	21	18	16	15
29	35	32	29	26	23	20	17	16	15
30	34	31	28	25	22	20	17	15	14
31	33	30	27	25	22	19	17	15	14
32	32	29	27	24	21	19	16	15	14
33	31	28	26	23	21	18	16	14	13
34	30	27	25	23	20	18	15	14	13
35	29	27	24	22	20	17	15	14	12
36	28	26	24	21	19	17	14	13	12

In figuring with the point system it is always necessary to remember that 72 points make an inch. It is then easy to compute the number of ems of any type-size in a square inch by dividing the type-size into 72, and multiplying the quotient by itself. For instance, figuring with 6-point type, 6 divided into 72 equals 12; 12 multiplied by 12 equals 144, the number of 6-point ems in one square inch. In 8-point type, 8 divided into 72 equals 9; 9 multiplied by 9 equals 81, the number of 8-point ems in a square inch. With 12-point type it would figure: 12 into 72, 6 times; 6 times 6 equals 36 ems to the square inch. With 10-point type, 10 into 72, 7.2 times; 7.2 multiplied by 7.2 equals 51.84 ems in a square inch.

All the examples and illustrations printed in this chapter are based on the square em; that is, a 6-point em is 6 × 6 or 36 points square. The square of the 8-point em is 64; that of the 10-point em is 100, etc. In computing Monotype faces, the set of which is not always square, but varies slightly from the ordinary foundry type, allowance for this difference in set must be made. A 10-point face may be 11-, 10-, or 9-point set; a 12-point face may be 11-, 12-, or 13-point set, etc. The square points in an em of 8-point size, 9-point set, are 8 × 9, which equals 72 square points; in an em of 6¾ set, 6-point size, 6¾ × 6, which equals 40½ square points. This variation in set must be taken into consideration when figuring Monotype matter, if close accuracy is required.

Measuring Linotype Matter

The following rule may be employed in measuring Linotype or other slug-casting machine matter: Multiply the length of the line in picas by 12 and divide by the number of points of the type face to be figured.

Example: How many ems of 7-point in a line 24 picas wide?

24 picas multiplied by 12 points equals 288 points.
288 points divided by 7 equals 41 ems, approximately.

To find the number of ems in a galley of Linotype matter proceed as follows:

(1) Find the number of picas in one line.
(2) Find the number of inches of matter on the galley.
(3) Reduce the inches to lines, and multiply by the number of ems in each line.

Example: How many ems of 8-point Linotype matter, 13 picas wide, 21½ inches being counted a full galley?

13 picas multiplied by 12 points equals 156 points.

156 divided by 8 points equals 19½ ems of 8-point in each line.

21½ inches divided by .110 inches (thickness of 8-point slug) equals 195 lines.

195 lines multiplied by 19½ ems equals 3802 ems of 8-point matter, on a galley 13 picas wide by 21.5 inches deep.

How to Estimate Body-Type

In order to estimate the quantity of solid type required for newspaper or book work, find the number of square inches of type-matter to be set, and divide this number by 4, which will give the approximate weight in pounds; to this figure add 25 per cent for sorts or little used letters which would remain in the case after the completion of a job of composition. If the matter is to be leaded the weight of the type may be reduced about one-quarter. A mass of type covering a surface of 4 square inches, or 2 inches square, of solid type weighs approximately one pound, and contains the following number of ems:

	Ems		Ems
5 point	829	9 point	256
5½ point	685	10 point	207
6 point	576	11 point	171
7 point	423	12 point	144
8 point	324		

Two useful tables, to aid the printer in making calculations of various kinds, are presented here.

Decimal Table for Printers

This table shows the decimal figures for the height of printing bases, plates, electrotypes, etc., and also the decimal inch equivalents of several sizes of type:

	Parts of an Inch
Type high is	0.918
Bottom of type galley	0.050
Height of sectional blocks and bases for regular 11-point plates	0.759
Regular 11-point plates	0.1522
Regular 16-gage zinc or copper plates	0.065
Height of bases for regular 16-gage zinc or copper plates	0.853
Backing for zinc or copper (to make 11 points for patent blocks)	0.090
Height of regular leads and slugs	0.750
Height of high leads and slugs	0.860
Height of regular iron furniture	0.680

	Parts of an Inch
Height of regular metal furniture	0.664
One point is	0.01384
Two points is	0.02768
Three points is	0.04152
Six points is	0.08304
Eight points is	0.11072
Ten points is	0.13840
Eleven points is	0.15224
Twelve points is	0.16608
Twenty-four points is	0.33216
Seventy-two points is	0.96648

Pica Measurements Reduced to Inches

The table here given shows from 1 to 100 picas converted into inches or decimal parts of inches.

Picas	Inches	Picas	Inches	Picas	Inches	Picas	Inches
1	0.166	26	4.316	51	8.466	76	12.616
2	0.332	27	4.482	52	8.632	77	12.782
3	0.498	28	4.648	53	8.798	78	12.948
4	0.664	29	4.814	54	8.964	79	13.114
5	0.830	30	4.980	55	9.130	80	13.280
6	0.996	31	5.146	56	9.296	81	13.446
7	1.162	32	5.312	57	9.462	82	13.612
8	1.328	33	5.478	58	9.628	83	13.778
9	1.494	34	5.644	59	9.794	84	13.994
10	1.660	35	5.810	60	9.960	85	14.110
11	1.826	36	5.976	61	10.126	86	14.276
12	1.992	37	6.142	62	10.202	87	14.442
13	2.158	38	6.308	63	10.458	88	14.608
14	2.324	39	6.474	64	10.624	89	14.774
15	2.490	40	6.806	65	10.790	90	14.940
16	2.656	41	6.640	66	10.956	91	15.106
17	2.822	42	6.972	67	11.122	92	15.272
18	2.988	43	7.138	68	11.288	93	15.438
19	3.154	44	7.304	69	11.454	94	15.604
20	3.320	45	7.470	70	11.620	95	15.770
21	3.486	46	7.636	71	11.786	96	15.936
22	3.652	47	7.802	72	11.952	97	16.102
23	3.818	48	7.968	73	12.118	98	16.268
24	3.984	49	8.134	74	12.284	99	16.434
25	4.150	50	8.300	75	12.450	100	16.600

CHAPTER XIII

TABULAR COMPOSITION

Tabular matter or *composition* is that kind of composition which is made up primarily of figures, leaders, and rules, and is used for many kinds of jobs. The word "table," used as a technical printing term, implies an orderly arrangement of topics, with words or figures in one, two, or more vertical or horizontal columns; a list, an index, a collection of headings, or numbers; a synopsis; any condensed statement which may be comprehended by the eye in a single view; any collection or arrangement in condensed form for ready reference, like weights, measures, currencies, tariffs.

Before the compositor attempts to set tabular matter, he should be thoroughly familiar with the point system. He must be able to convert the ems of one size of type into points or ems of another size, either larger or smaller. He must know the thickness in points of the comma and the period. These are usually as thick as a 4-to-an-em space; but in some fonts of type they measure as much as a 3-to-an-em space, or one-third of the em of their type size. Nearly all numerals or figures are of equal thickness in the same type-body: they are one-half the thickness of the em quad of their type-size, or equal to an en (nut) quad. Boldfaced figures and most of the sans-serif (modern gothic) numerals are not cast on an en-body. In some of the classic oldstyle fonts, like Caslon 471, and Garamond, when they are foundry-cast, there is a variation in the width of the figures.

Leaders, and Their Purpose

Leaders, as their name indicates, serve the purpose of leading the reader's eyes from one line in a column to the corresponding line in another column. They are extensively used in *tabular* and *figure* work, especially in the *stub*. Leaders prevent confusion and aid the reader in following from one column to the next, across the width of a job. In the use of leaders consideration must be given to the width or distance between columns. If columns of figures are close together, there is little

chance for misreading, or jumping to the line above or below, so that leaders are generally omitted in such case. If, however, there is any chance of misinterpretation, leaders should be used.

There are three styles of leaders in common use today, the *open-dot, fine-* or *close-dot*, and the *hyphen* leaders. A sample of each is shown below. Hyphen leaders print intermittent or dash lines and seem to be increasing in popularity, because they are more durable and print a more pleasing line than the dot leaders. Type founders supply leaders cast on high-quad bodies of en, em, 2-em, and 3-em widths, in sizes from 5-point to 18-point. Open-dot leaders run one dot to the em; close- or fine-dot leaders run two or three dots to the em; hyphen leaders run two strokes to the em. Leaders are not a part of the ordinary type font, but are kept in special boxes outside the standard type case.

These are 10-point open-dot, sometimes called wide-dot leaders . . . . . .
These are 10-point close-dot, sometimes called fine-dot leaders ....
These are 10-point hyphen leaders - -- ---- -----

How to Set Tables

The usual form of table consists of a *stub* (which is the column of names, reading matter, and leaders at the left-hand side) and one, two, or more columns of figures. Planning the setting of a table is called *casting up*. In casting up the compositor must decide how many ems he has to allow for each column of names and figures. The width or measure of the whole table in inches or ems is generally written on the copy before it is given to the printer. This width must be used in computing the width of the several columns or units which make up the table. A careful examination of the copy will show how many ems of 6-, 8-, 10-, 12-point or larger-sized figures can be set in one line. This is illustrated in the very simple form of table shown here, with one column of words and leaders at the left-hand side, in the stub, and one column of figures at the right-hand side. The table is set in 8-point Goudy Oldstyle, 16 picas wide; if it were to be set in 10-point type it would require more than 16 picas for each line.

Value of Products—	1927
Printing and publishing	$2,507,425,913
Bookbinding and blank books . . .	87,327,392
Paper and pulp	1,138,089,666

TABLE 1

The next table shows a group of words at the left, followed by leaders to guide the eye over to the figures at the right, which occupy two columns. The table is set 18 picas wide.

Value of Products—	1927	1925
Printing, publishing . .	$2,507,425,913	$2,269,638,230
Bookbinding, bl. bks. .	87,327,392	81,600,302
Paper and pulp	1,138,089,666	1,006,635,649

TABLE 2

The third table is the same as the second with two 2-point rules placed after the last column of figures. In casting up for this table, the stick is set on 18 picas and the two 2-point rules are placed in the stick at the right-hand side. The stub takes 7 picas, allowing 4 picas and 2 points for each column of figures; 12 points between the leaders and the first column of figures, 14 points between the two columns of figures, and 4 points for the two rules. This means that the stub, the figures, and the quads between the columns of figures will occupy 17 picas and 8 points, the remaining 4 points being taken up by the rules. Two 1-em 8-point quads are used between the columns and figures, and between the leaders and the first column of figures, computing for eleven figures and three commas in each column. After the lines are all set, the rules are taken from the side of the last column and inserted between the columns of numerals as shown in the fourth table. This table, like most of the others described, is set solid, without leads between the lines.

Value of Products—	1927	1925
Printing, publishing . .	$2,507,425,913	$2,269,638,230
Bookbinding, bl. bks. .	87,327,392	81,600,302
Paper and pulp	1,138,089,666	1,006,635,649

TABLE 3

Value of Products—	1927	1925
Printing, publishing . .	$2,057,425,913	$2,269,638,230
Bookbinding, bl. bks. .	87,327,392	81,600,302
Paper and pulp	1,138,089,666	1,006,635,649

TABLE 4

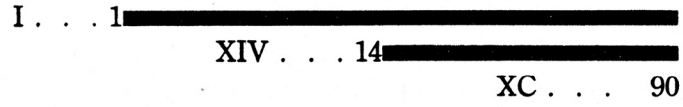
MULTIPLE JUSTIFICATION

Multiple justification, that is, spacing out and justifying various sections of a line two or more times, is practical in setting tables of two or more columns of words, letters, and figures. Two methods may be used

to aid in securing an accurate line-up of the columns. One method of composing parallel columns is to set each column separately in a narrow measure, changing the stick as often as necessary, and finally joining the columns or parts together to form the full measure. In this method extreme care must be used to see that each section is uniformly justified, so that the several columns will exactly fill the full-width measure of the table. Any difficulty of this kind may be avoided by the employing of another method and using *justifying gages,* which are accurate brass rules or slugs, the exact width of the second, third, and subsequent columns. If there are three columns, two justifying gages are required, as shown below.

THE USE OF JUSTIFYING GAGES

The first three lines in the fifth table show how three columns of letters, leaders, and figures can be set in one line or measure of the composing stick by using brass rules or slugs as justifying gages. The two 4-point face rules are the gages in this job.



ROMAN NUMERALS AND ARABIC EQUIVALENTS

I . . . 1	XIV . . . 14	XC . . . 90
II . . . 2	XV . . . 15	C . . . 100
III . . . 3	XVI . . . 16	CC . . . 200
IV . . . 4	XVII . . . 17	CCC . . . 300
V . . . 5	XVIII . . . 18	CD . . . 400
VI . . . 6	XIX . . . 19	D . . . 500
VII . . . 7	XX . . . 20	DC . . . 600
VIII . . . 8	XXX . . . 30	DCC . . . 700
IX . . . 9	XL . . . 40	DCCC . . . 800
X . . . 10	L . . . 50	CM . . . 900
XI . . . 11	LX . . . 60	M . . . 1000
XII . . . 12	LXX . . . 70	MC . . . 1100
XIII . . . 13	LXXX . . . 80	MD . . . 1500

TABLE 5

This table is 17 picas wide, set in 8-point Century Oldstyle, and has three columns. The columns are spaced about an equal distance apart.

Instructions for setting: Secure two 4- or 6-point brass rules or slugs: one that is 13 picas long, and one that is 7 picas long. Place the 13-pica gage in the composing stick (which is opened to 17 picas) at the right-hand side, as shown in the illustration; then set the I . . . 1, and justify

out to 4 picas, or tight against the 13-pica gage; next remove the 13-pica gage and put the 7-pica gage into the stick; set the second column (XIV . . . 14) and justify; finally, remove the 7-pica gage, set the third column (XC . . . 90) and justify against the first two columns and the right-hand side of the composing stick. Space all columns from the right-hand side toward the left-hand side. After the first line is set, place a lead after it and proceed with the next line. Allowance for the first column is 4 picas; second, 6 picas; third, 7 picas.

Tables with Box-Heads

When a table has its headings enclosed within horizontal and vertical rules, it is said to have *box-heads* or "boxed-in" headings. A simple style of such tables is shown in Table 6. There are, in the different kinds of commercial work, many tables which at first glance appear very complicated. In setting difficult tables with primary and secondary box-headings the practical way is to set first one box, then the next, and so on. The separate boxes or sections may be temporarily placed on another galley, to be assembled with other parts of the table later.

Number of Establishments, Wage-Earners, and Value of Products, Book and Job Printing, Four Cities, 1899 to 1923

Year[1]	*Establishments*	*Wage-Earners*	*Value of Products*
1923	3,092	51,953	$337,067,459
1921	2,965	49,245	325,045,939
1919	3,715	50,197	286,588,356
1914	3,475	47,397	148,538,177
1904	2,619	37,639	90,843,399
1899	2,271	35,792	63,271,252

[1] In 1909 the census did not give separate figures for book and job printing.

TABLE 6

Table 6 is set 23 picas wide, and it has a stub and three columns of figures, with a box-head over each column. Allowance for the different columns: First column, 6 picas; second, third, and fourth columns, 5½ picas each. This makes 22½ picas, leaving six points for the three 2-point rules which separate the columns.

A great deal of all tabular matter is set on machines—usually Monotypes. On these machines the spacing and justification are practically automatic, but the machines will not put in the rules; these must be put in by hand, after the type is set. Another method of producing tables on Monotype is that in which the columns of figures are composed and put into place in the page, after which the entire page is electrotyped, the rules being put in on the wax mold by a special machine. This is called the *wax-rule* method of tabular composition. Briefly, the process consists of making a wax matrix of the figures, titles, etc., which are to be in the table. This mold is then laid on the *ruling machine*, in which needles of different size will groove the surface of the mold, producing vertical, horizontal, or diagonal lines of varying thickness, either single or double, as close together and as many of them as desired. As the lines cross one another, all joints are perfect, and all rules of the same kind are uniform in thickness. Of course, the figures, leaders, titles, etc., for the tables may be set by hand instead of on a composing machine.

Machine-Set Tabular Matter

In shops where Linotype machines are used, several labor-saving methods of casting tables have been devised. In the *Rogers system* certain special attachments can be applied to the machine. The equipment consists of a font of matrices, special spacebands, and a tabular mold, including a pair of liners and other minor parts.

Tabular matter may also be produced on machines by the use of vertical-slug matrices. These matrices differ from the ordinary matrices in that the characters are punched horizontally or transversely in the edge of the vertical slug, instead of side by side as is the case on the ordinary slug.

A Complicated Table

Table 7 is 24 picas wide and 20 picas deep, set in 8-point Century Oldstyle type. In setting narrow columns of figures within boxes of tabular composition, without the use of justifying gages, a piece of accurate metal furniture, say about 5 by 3 picas, may be placed in the composing stick in order to open it a convenient width—somewhat wider than the column to be set—so that the thumb and the fingers may do their work of setting and justifying the type effectively.

Instructions for Setting Table 7: This table requires seventeen pieces

of hairline rules and four pieces of ¾-point face rule, all on a 2-point body. Lengths of rules—outside: two 24-pica pieces, two 20 picas; inside: four 20-pica pieces, two 10-pica pieces, two 7-pica, two 4½-pica, four 4-pica, three 3½-pica. Obtain the rules, and then proceed to set the table in sections. Beginning at the left, the first (vertical) box is 4 by 6 picas; the next (horizontal) box, 4 by 3½; the lower panel, 4 by 10 picas. The second column (vertical), 3½ by 9½ picas; below, 3½ by 10 picas. Middle column, 7 by 6½, 3½ by 3½; 3 by 3½; 3½ by 10, and 3 by 10 picas. In this column 2-point leads are placed on each side of the vertical 3½-pica and 10-pica rules, to make the full 7 picas. Fourth column, 4½ by 6½ picas; then two 2 by 3½ picas; two 2 by 10 picas; also 2-point leads on each side of the vertical rules. Fifth column, 4 by 6½ picas; 4 by 3½, 4 by 10 picas. The seven lower columns of the table have an extra 2-point lead above and two 2-point leads below the columns. Blank spaces of six points or wider should be filled in with quads. Use leads for spacing out only where absolutely necessary. Leads give or compress more than quads, and cause a "springy" effect in tabular matter.

Applies only to Type Faces of Normal Width	Square Inches in 1000 Ems of Straight-matter Composition	Figures may vary slightly if cast on Monotype		Words in a Square Inch of Type Matter		Figures given are for 2-point Leads
Body Size of Type		Ems in a Square Inch	Ems in 1 lb. of Type	Solid	Led'd	Leads in 1000 Ems
4½-point	3.91	256.	1024	82	8	5½ ounces
5 -point	4.82	207.3	829	60	11	6 ounces
5½-point	5.84	171.36	985	52	14	6¾ ounces
6 -point	6.94	144.7	576	47	16	7½ ounces
7 -point	9.45	105.8	423	38	20	9 ounces
8 -point	12.35	81.	324	32	23	10½ ounces
9 -point	15.63	64.	256	27	27	11 ounces
10 -point	19.29	51.84	207	21	34	12½ ounces
11 -point	23.34	42.837	171	17	40	14 ounces
12 -point	27.78	36.	144	14	44	16½ ounces
14 -point	40.00	25.	100	11	57	18 ounces

TABLE 7

In the composition of tabular matter every lead and every point should be counted, and all columns or sections must contain the proper number of points. It is unwise to assume that columns are of the same point-length until carefully computed and checked.

The Use of Ditto-Marks

In some kinds of tabular work ditto-marks may be effectively used when a repetition of the same words occur a number of times in lines which follow one another. The marks are made by turning two commas upside down, thus ‘‘. Here is a sample of the use of ditto-marks:

One	pound	of	10-point	type	will	contain	approximately	207 ems
“	“	“	11-point	“	“	“	“	171 ems
“	“	“	12-point	“	“	“	“	144 ems
“	“	“	14-point	“	“	“	“	108 ems

In general, however, the use of ditto-marks is not desirable in book or magazine work. When only a few repetitions of words occur, the words, spelled out, are repeated. If too many repetitions would occur in any form of table, the table is brought to form by substituting column headings in place of using the repeated words.

CHAPTER XIV

CABINETS, STANDS, RACKS, AND TABLES

The types, borders, ornaments, rules, leads, slugs, galleys, and other materials which the compositor needs in his trade, are stored, when not in active use, in cabinets, stands, racks, and the like, which are especially designed and manufactured for the purpose. Large pieces of equipment for the printshop are constructed of either wood or metal, and many different sizes and styles of *composing room furniture* are shown and described in dealers' catalogs.

Stands and Racks

Printers' types are kept in cases, and the cases are kept in stands, racks, or cabinets. Of these there are many styles and sizes. The ordinary compositor's workstand is constructed of wood or metal, and has an inclined top on which one or two cases may be placed. Each stand has a rack in the lower part to hold additional cases. A single stand will accommodate about twelve cases in its rack; a double stand will hold twenty-four cases below and four on top.

American School Type Cabinet

The latest development in school type-stands is the American School Type Cabinet, shown in Figure 1. The height of the frame or stand in relation to the compositor should be so adjusted that the right elbow will just clear the front of the lower-case "a" box during the operations of setting type, without the smallest elevation of the shoulder. The adjustable top on this new stand makes it possible to have the type-cases lie at any elevation from a minimum of 37 inches up to a maximum of 43 inches. The lifting device consists of two parallel screw posts, raised or lowered by nuts operated by spiral gears. The power is applied by means of a removable crank. This cabinet requires a floor space of 24 by 27 inches. It has fourteen full-size cases; and under the sloping top is a

drawer (which can be locked) that may be used as a galley- or correcting-bank. Two compositors may work on opposite sides, leaving free access to the cases and supply of leads and slugs in the rack below.

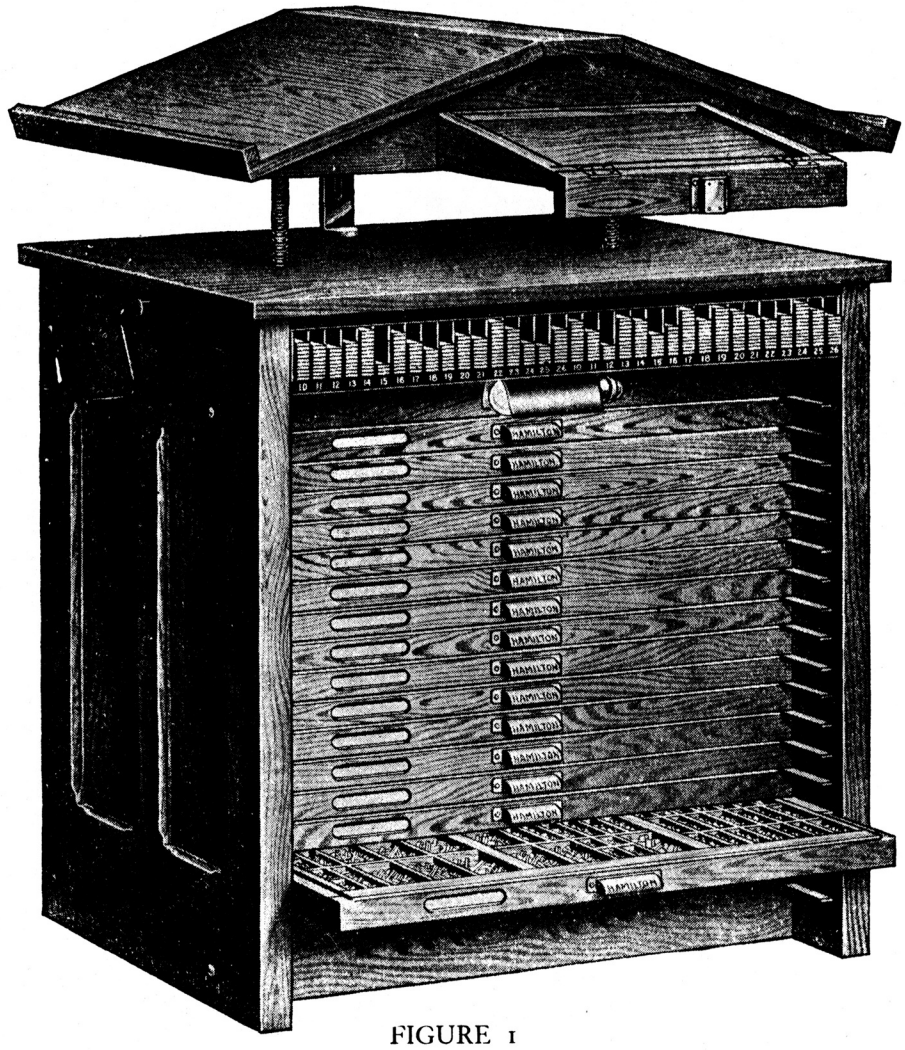


FIGURE 1

The American school type cabinet, with adjustable sloping top, writing-boards, and galley-bank.

Cut-Cost Type Cabinets

This style of composing room equipment is ranked among the labor- and time-saving furniture of the typesetting department. By use of these cabinets it is possible to concentrate all the materials for the compositor within a restricted area. Single or double cabinets, either of wood or metal, may be had. A double cabinet has a capacity, on one side, of forty-six cases and two blank cases, and in addition there are receptacles for spaces and quads in nine different body sizes, leads and slugs in lengths

from 1½ to 50 picas, and copper-thin (½-point) and brass (1 point) spaces. On the working side of the cabinet there is a bench or bank, giving ample room, wholly for the use of one compositor, with nothing under it that would cause another compositor to retard the work by interference.

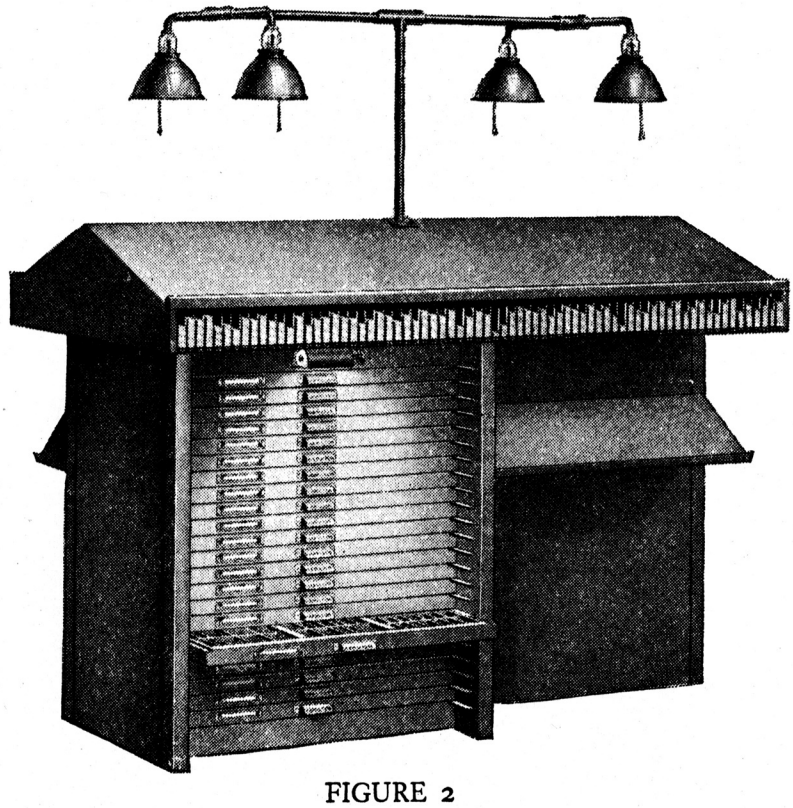


FIGURE 2

An Ad-Man type cabinet and work-bench.

Under these working conditions compositors have little occasion to leave their *alleys,* and constant production is easily possible, because there is a nearby place for everything needed. The work may go on with an approach to machine-like precision. But while such conditions are desirable, they are not common in all shops. The compositor should strive to study out a plan which can be applied to the equipment with which he has to work and the tools at his disposal, in order that he may become an efficient printer and producer. Many unnecessary steps to and from the lead rack can be avoided if the compositor plans his work systematically.

Furniture Cabinets

These cabinets for storage of printshop materials are made of wood or metal, in several sizes, to hold large quantities of wood or metal

furniture. Each printshop usually has two racks or cabinets—one in the composing room, where the metal furniture is kept, and another one in the pressroom, where the wood furniture is stored. All modern imposing tables have compartments for the storage of wood furniture.

Galley Cabinets and Galley Storage

Not all type that is composed or assembled in the composing room can be locked up, taken to the pressroom, and printed at once. Hours, days, weeks, and sometimes months elapse before the type, or the elec-

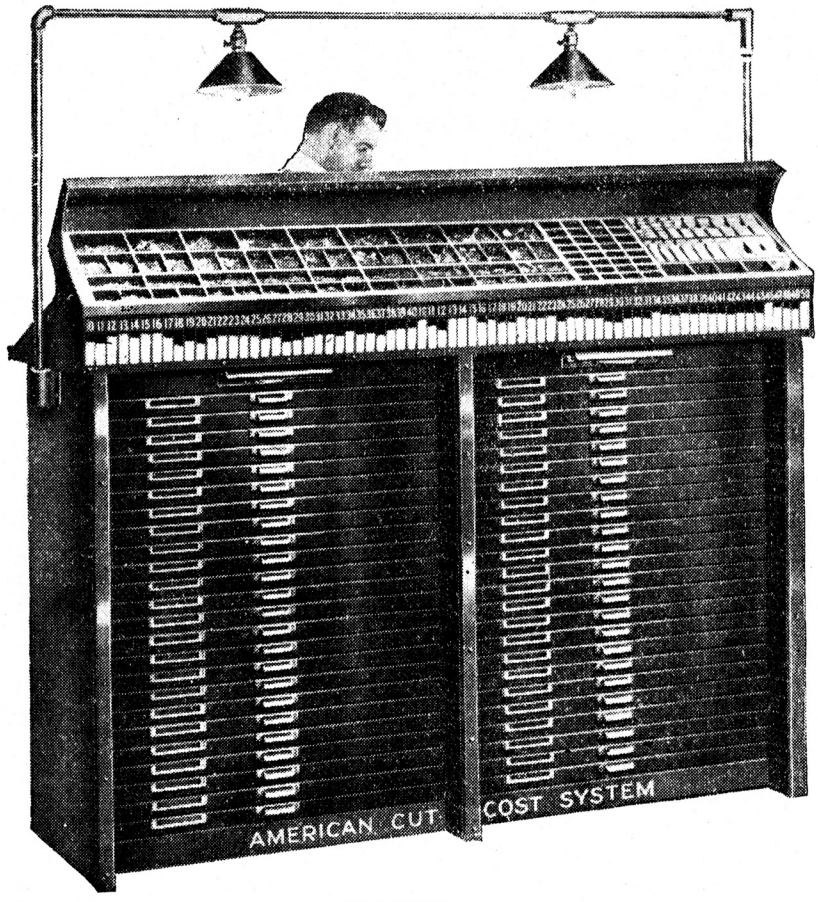


FIGURE 3

A modern steel type cabinet, completely equipped.

trotypes or stereotypes made therefrom finally reach the press. This necessitates ample galley storage in the composing room before the pages are corrected, and in the pressroom after they are corrected and ready to be imposed and locked up. Years ago composed type was kept on galleys until all corrections had been made, and then it was pushed

onto *letterboards,* but this was an impractical method of procedure. Letterboards waste considerable time in the composing room; they are right enough for *dead matter,* or when it is required to store extra large forms, but otherwise their use has been abandoned in favor of some efficient system of galley storage. One of these systems requires that a job or page shall be set up or made up on a galley, and that it shall not leave the galley from the time the work is started until it is taken by a *stoneman.* When the first proof is taken, the galley holding the job is placed in any vacant opening in the *imposing table* or a galley cabinet, and the number at the side of the opening (or on the galley-label) is penciled on the proof, and thus becomes an index of the exact location of the job. When the proof is given out, after reading, anyone can find the job. The same process of proving and numbering and finding is gone through with the revise proof and customer's proof, until the final proof reaches the stoneman and the galley is released.

Instruction: In putting galleys of type or engravings into or taking them from a galley cabinet, great care should be taken that the contents of the galley is not injured. The ends of the type-lines may easily be damaged by striking them against the slides or rungs of the cabinet. There is just enough room for one galley between the different slides in the cabinet, and therefore each galley must be carefully and slowly inserted or taken out. Be cautious also, that no type falls off the back of the galley; and be sure that the number on the proof is the same as on the galley-label or the galley-slide. All type on galleys should be clean; any ink left on its surface will dry hard within a day or two, thus necessitating a loss of time in removing it when the galley finally reaches the stoneman. And—don't forget that nearly all galleys will rust if kept in a damp place, or if water is put on them. Wipe the galleys off with an oily rag occasionally.

Imposing Tables

Until recent years the preparation of forms for the press was done almost entirely on a table of smooth stone (marble, granite, or slate), and this table was called an *imposing stone.* The old imposing stone is rapidly disappearing from the modern printshop, and in its place the steel *imposing table,* with a generous supply of lock-up material, is gaining in favor. The man who works at it is called the *stone-man.*

All imposing tables have the edges rabbeted or mortised to a depth of six points or more, in order that the bottom of the galley may rest upon it while the tied-up pages are pushed from the galley to the stone or vice versa.

Dealers' catalogs show a great variety of styles and sizes of imposing and make-up tables. The size of imposing tables required in a compos-

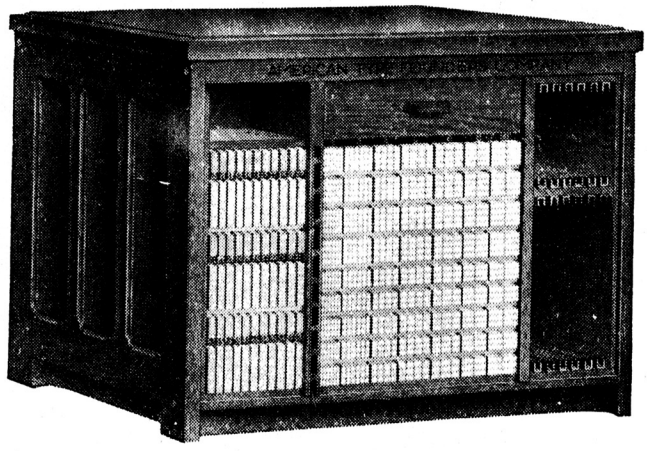


FIGURE 4

One side of the American school imposing table, showing wooden furniture on the left, and chase-racks on the right.

ing room depends upon the sizes of the presses in the shop. Obviously, there must be an imposing surface at least as large as the largest chase used on the presses.

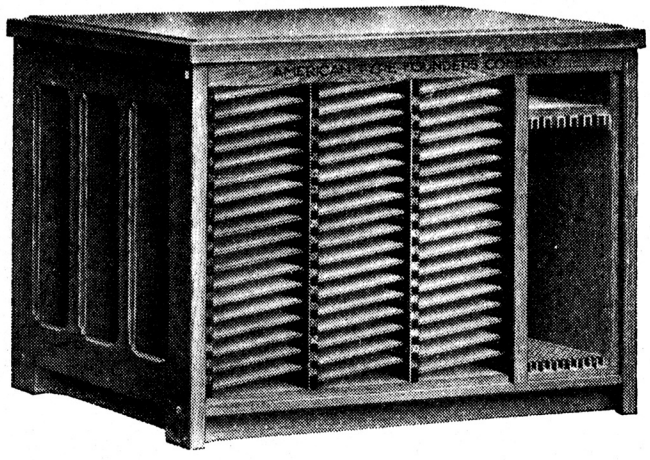


FIGURE 5

The other side of the American school imposing table, showing the galley-racks and chase-rack.

In the construction of all modern imposing tables the space underneath the top is utilized for the storage of furniture, reglets, and other lock-up materials, bases, quoins, keys, etc., or for the storage of type,

galleys, and letterboards. Some tables have many drawers, which may be used for the storage of cuts, sorts, etc. Still other imposing tables have a rack for holding different sizes of chases.

Proofreader's Desk

As the work of the proofreader is trying, and the requirements of his position are most exacting, a specially designed desk, which is in reality a private workroom for the proofreader, is available. The illustration on page 199 shows the Hamilton proofreader's desk, which is made in steel or wood. The flexible conduits provide direct light where needed; elevating reading-boards keep the copy in the position which is least tiring to the reader; there are compartments for copy and reference books; two drawers for pencils, etc.

CHAPTER XV

LOCK-UP APPLIANCES AND PLATE BASES

Some of the small lock-up equipment of the printshop—furniture, reglets, planer, mallet, etc.—has already been discussed under Compositors' Tools, in Chapter V, because such materials are not used exclusively for lock-up purposes. In this chapter we will treat those articles which are intended for use on or near the imposing stone.

Chases

The iron frames in which type and printing blocks are imposed and locked up for the press are called *chases*. Printers' chases are made in many styles for various uses. For small platen presses, the chase is a simple cast-iron frame, slightly beveled on the two long sides, and made especially to fit its place on the bed of the press. For book and other large work on cylinder presses, stronger chases are made of wrought-iron or steel, strongly welded at the corners and having cross-bars fitted in them, in order to enable the stoneman to lock up large forms with the greatest possible security. The thickness of the chase as it lies around the form is a little less than type-high, so that the rollers of the press may pass over the form without touching the chase or its accompanying furniture, quoins, etc. Two chases, made to lie side by side on a cylinder press, are *half-* or *twin-chases;* a large chase without cross-bar is a *broadside* or *poster chase;* a chase to contain two pages of small newspaper usually has a cross-bar the short way of the chase, to go between the pages; another style is divided into quarters by two cross-bars. The cross-bars may be fixed in the frame or they may be removable, the ends being "dovetailed" to fit into slots. Chases for cylinder presses have all outer sides without bevels, in order that they may be locked firmly when placed on the bed of the press. The chases used for locking up forms for electrotype and stereotype molding are rarely larger than 12 by 18 inches, are extra thick and strong, and are called *foundry chases.* Daily newspapers, printed from stereotype plates, require especially heavy chases, one for each page, which are fitted with a wedge-and-screw

device for quick locking up. The width of the ordinary chase-bars—side, end, or cross-bars—ranges from one inch in the smallest sizes up to one

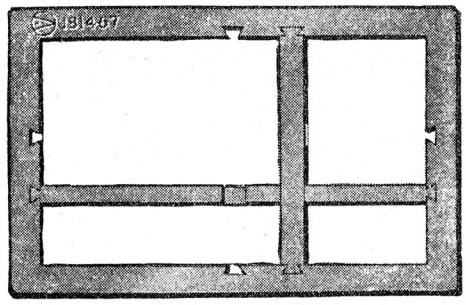


FIGURE 1

Book-chase, with removable cross-bars.

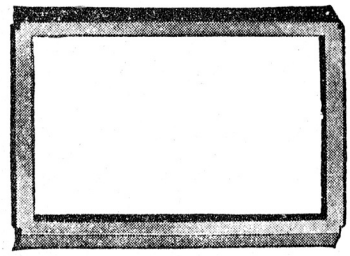


FIGURE 2

A platen press chase.

and one-half inches in the largest sizes. The thickness of the bars is five-eighths inch, which is slightly less than that of metal furniture.

The best chases for platen-press use are those with solid corners, of one-piece electrically welded steel. In electric welding precisely the right heat may be applied to obtain that degree of fusibility necessary to cause the molecules of steel to intermingle just exactly as they would were the metal melted and cast in a mold.

The McCreal combination chase has shifting cross-bars for long and short dimensions. Each piece is interchangeable with every other piece. Any two pairs of bars necessary to form a chase can be put together and taken apart in a few minutes, thus making it possible to form many different combinations of sizes. The smallest size of bar is 4 inches in length, and each successive size is 2 inches longer up to

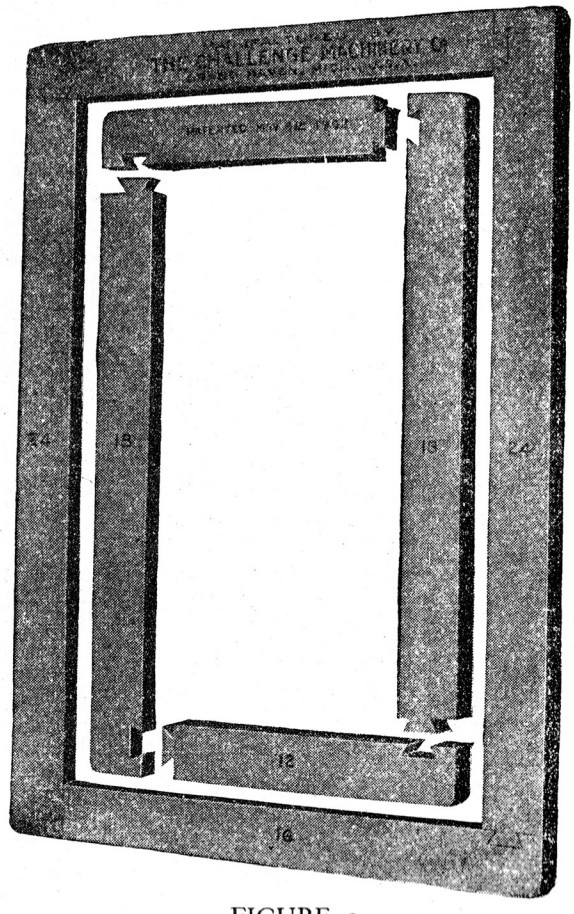


FIGURE 3

The McCreal combination chase.

69¾ inches. Cross-bars range from 4 inches up to 28 inches in length; they are ¾ inch wide. Every bar is plainly stamped with figures to indicate its size.

Quoins

It is presumed that the first printers tightened their forms for actual printing by the insertion of wedges of some sort between the sides of the type and the surrounding frame (or chase) which held the form in place. Some early chases held the type firmly by means of pressure screws which perforated the bars of the chase. The method which preceded the

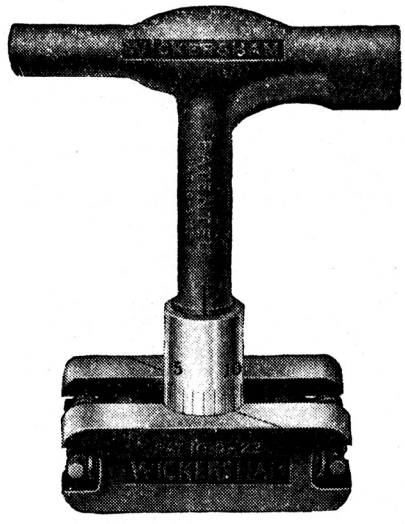


FIGURE 4

A Wickersham quoin, partly expanded, with key in the socket of the quoin. The quoin is expanded or made tight by turning the key from right to left.

introduction of the mechanical *quoin* was that of tightening up a page of type and similar material enclosed in a frame by means of driving two beveled pieces of wood in opposite directions, so that their thick ends would gradually close up on each other. Beveled *sidesticks* or *footsticks* and wooden wedges were used, and the wedges were driven by means of a mallet and a tool called a *shooting-stick*. This method was slow, noisy, and frequently productive of uncertain results, and was discarded with the advent of the metal quoin.

Among the practical metal quoins in general use today may be mentioned the *Wickersham*. This consists of a small metal case made up of two side-pieces held together at the ends by small wire-coil springs. In the center of the case there is a round three-disk cam which is fitted to

corresponding bearings in the side-pieces. The turning of these interior cams by inserting a key in the top opening expands or contracts the width of the quoin. These quoins are made in several sizes, 2 inches and 3 inches long, and ½, ⅝, and ¾ inch wide when closed.

Wickersham quoins are also used in combination with long metal sidesticks, having two or more quoins attached to them. This combination is called *Morton Lock-up*. The device combines a sidestick or footstick with Wickersham quoins all in one piece, and this, together with its weight, when placed directly against foot-slug or type prevents all leanings or shiftings of lines. The Morton Lock-up may be placed di-

FIGURE 5
Hempel quoins and key.

rectly against the foot-slug, at the bottom of a page, and against type, at the side, when conditions permit; otherwise against the reglets and furniture or chase.

Three styles of keys are furnished with the Wickersham quoins—the removable peg key, the pocket key, and pressman's right-angle key. The right-angle key is especially convenient when quoins are at the back of a form on a cylinder press, close to the rollers, or where height of space is limited.

The *Hempel Quoin* is one of the old reliable lock-up devices. It is very simple and durable in construction and consists of two wedge-shaped pieces of steel which fit into each other so that when they are moved laterally by means of a key the thickness of the quoin is increased.

It was invented by Henry A. Hempel about 1878, and is still in general use in American printshops. The Hempel quoin gives a lateral motion as well as an expanding motion when the two wedges are drawn together. In many places this twisting pressure makes it difficult to keep the form truly square; extreme care is necessary to guard against an undesirable lateral force when only an expansive force is needed. Sometimes there is liability that the two parts of the quoin may slip back and loosen the pressure after locking up, which is usually caused by the jarring of the press during the printing. This is a defect which may easily be remedied by the pressman's taking the precaution to insert a plug of some sort between the teeth of the quoins after the form is finally locked up for the press run.

Some of the newer Hempel style of quoins have corrugations on the center ribs and slots, which is a safety feature, making the quoins less likely to loosen up after being locked with a key. These quoins have beveled points and heels, which facilitate the slidings of half of this quoin into the other.

A special key is required for Hempel style quoins, as is shown in Figure 5. There is, however, a key which can be used interchangeably on several styles of quoins. This is the Challenge Triple Combination Key, which fits the No. 1 and No. 2 Hempel and Wickersham quoins, and also other quoins.

Plate Bases and Plate Blocks

The invention of the stereotype, electrotype, and later, the photo-mechanical *line,* and *halftone* engraving plates as printing surfaces made necessary the introduction of suitable bases for these relatively thin plates. They are usually made to a thickness of 0.153 inch (about 11 points). Wood was the first material used for blocking stereotype, electrotype, and line and halftone plates, and to a limited extent wood is still used when mounting small plates, the plate being fastened with wire brads or screws to blocks 0.765 inch thick. The plate and the base together bring the printing surface up type-high (0.918 inch). Wood bases may serve quite well for the mounting of electrotype plates or line-engravings of small or medium size, but the growing use of fine-screen halftone engravings and color-plates of solid or near-solid surface has made necessary a base firmer than wood, and the iron or steel or aluminum base upon which a plate whose edges are beveled at an angle of

20 degrees can be fastened, has become quite common in recent years. The greater precision required in registering color printing has also

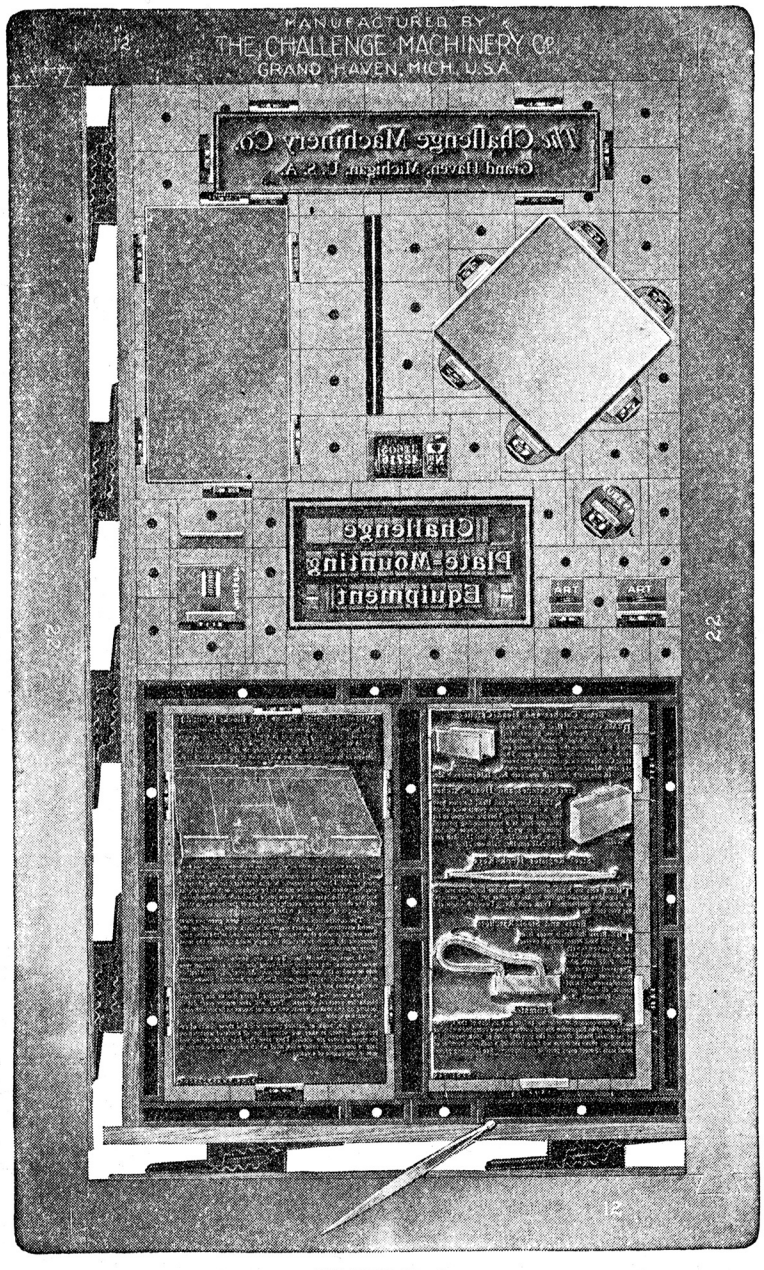


FIGURE 6

Beveled plates attached to bases, and locked up in one chase, with the type in the center.

created a demand for a metal base; and with it have come a number of devices for holding the plates and for moving them into exact position with speed and accuracy.

Metal plate-mounting bases may be grouped into three classes: the

individual base; the sectional base, made up of pieces of various sizes, which may be assembled into pages or forms; and the large one-piece base covering practically the entire bed of the press. If the press is very large, two or more of these large bases may be required.

THE WESEL "FINAL" BASE AND HOOKS are made to order to fit any type of flat-bed cylinder or platen presses. The positive clamping action of the base and hooks gives a sufficient resistance to the shock and the strain of rapid printing and swift reciprocal motions of the press bed. "Final" bases are made with inverted "T" grooves and "Final" hooks have double-locking bolts that give a mechanically positive resistance to

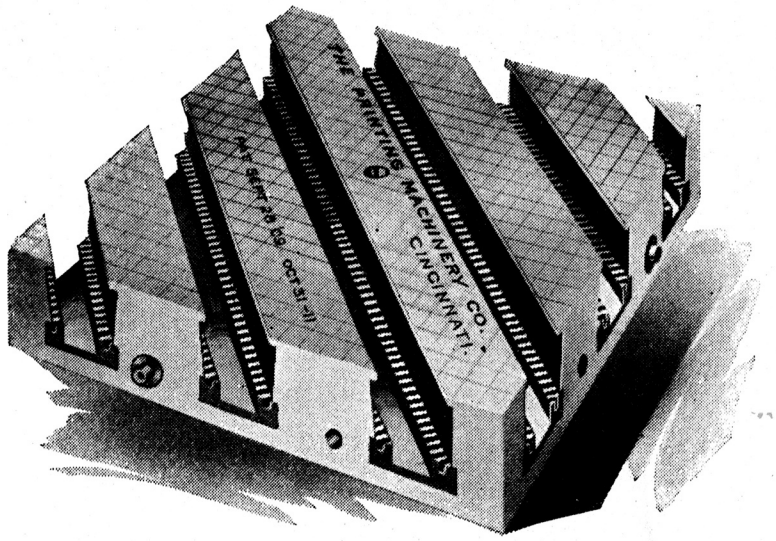


FIGURE 7
The Warnock diagonal base.

the upward pull of the plate. The hooks are self-contained, having no detachable parts. When the hooks are inserted—which is done with the fingers—they will not move in the grooves until the locking and registering key has been applied. The grooves are supplied with threaded, steel bearers on each side, well up from the bottom, and the hooks are fitted to engage and slide upon these bearers. The hooks have a screw which engages the bearers on both sides and gives a micrometer-like adjustment along the groove for perfect register. A small key is the only tool used in operating the hooks, and with it the locking bolts are turned crosswise away from the "T" groove, and the screw is rotated to set the hook up to, or back away from the plate.

THE WARNOCK DIAGONAL BASES are made in standard units 4 by 4 inches. The adoption of this size of unit makes the system flexible and

adaptable interchangeably in large and small forms. Special units for filling chases to their limit are provided, 3 by 4 inches, 2 by 4 inches, 1 by 4 inches. An aluminum alloy, cast in sand, is used to give the advantage of reduced weight. The standard unit 4 by 4 inches weighs one pound, and is about one-third the weight of cast iron. The racks, which are the

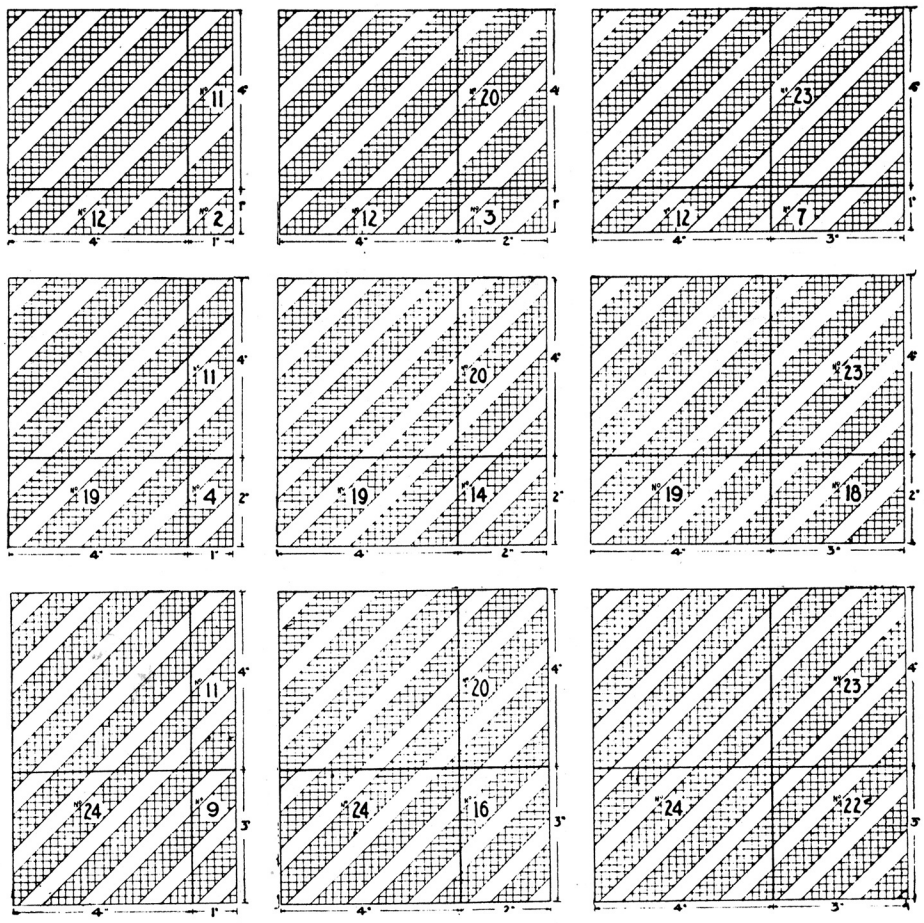


FIGURE 8

A diagram of Warnock bases, drawn to scale, showing how square and rectangular areas may be built up from one-, two-, three-, and four-inch sections. Each piece of base is a definite number of picas in dimension.

means of travel of the hooks, are of rolled steel, with cut teeth, which assure them strength. They are firmly riveted in the slots, besides being held by overhanging ledges. Dowel pins, with spring-supported plungers, are placed on each side of the block, with recesses to receive them. These are provided to allow adjacent blocks to interlock into one base with continuous-travel slots, preventing a "work-up" or lifting of the individual units. This arrangement gives all the advantages of the one-piece bed without the loss of flexibility. The bases are plainly

graduated to picas in both directions, to facilitate quick make-up of the form and register of the plate.

THE WARNOCK DIAGONAL HOOK. This device is a self-contained unit, having its means of operation within a substantial body. The jaw which surmounts the structure is made of steel and swivels freely on its axis. This permits the holding of plates of irregular shapes, or placed in any position on the form. The No. 4 jaw is the standard jaw used for ordinary plate mounting and has a 20-degree bevel. The No. 5 jaw is a higher jaw, used for the purpose of holding original half-tones, backed in metal, and is made higher than the standard, in order that it can grip the copper. This jaw also has a 20-degree bevel. The No. 8 jaw is used for narrow margin work and has a 10-degree bevel. The drive described is known to mechanics as a worm-and-screw drive, its peculiar feature is that when this drive is under tension and at rest it is a perfect lock.

To meet the demand of various folding machines, a small *perforation* or *slit* is required in the printed sheet as a guide for registering in folding. For this purpose a simple device known as the *Folder-Point* or *Slitter* is provided. The body has a rack on its lower face which meshes with the rack in the slot of the hook. On the top face a screw holds in position an adjustable slotted bar, at the end of which is fixed either a perforating point or a slitter-knife, as may be required.

The Warnock Diagonal System also includes a *Collating Marker* for book work, which consists of a graduated adjustable bar bearing a printing-mark, ⅛ by ¼ inch in size. This bar is mounted on a body similar to the folder-point and slitters. It can be dropped into the form at any desired point and adjusted as desired.

REGISTER AND LINE-UP SYSTEMS

There have been invented for the use of the printer many labor-saving machines and devices. In recent years great strides have been made in the improvement of many of the machines and devices of the printshop, and among these we have the devices for getting the units of a form into alignment and final position. In the small printshop the hand line-up process is still in common use, but in the shops where a great deal of book, catalog, and color printing is done *mechanical line-up and registering systems* are employed. These systems not only save a great deal of time but they make possible the greatest accuracy in lining up and registering type or plate pages.

In shops where there are no mechanical line-up tables, an accurately made steel T-square, or one made of a transparent material, which is graduated to inches and fractions of inches, and also to picas and half-picas, is a most useful and inexpensive tool for *lining up* pages.

The Craftsman Line-up and Register Table

The Craftsman Line-up and Register Table is considered one of the most practical in use today. It is constructed of steel, but it has a surface of heavy plate glass, under which is an illuminated compartment, finished in gloss-white. The printed sheet, to be *lined up* is laid upon the glass top, and the pressing of a button projects a flood of light upward, thus shining through the sheet. This light is sufficient for close *registering*. Two steel straight-edges, vertically and horizontally to each other, are attached to the table, and the geared connection of the straight-edges meshes to slotted tracks at each side of the table. On each straight-edge is a self-inking marking-wheel which rides along the edge of the straight-edges, and a simple raising device lifts the straight-edges off the paper when being moved from one position to another. Scales graduated to sixteenths of an inch are placed at three sides of the table.

CHAPTER XVI

STONEWORK AND IMPOSITION

Stonework and imposition are two inter-related operations of the printer's trade, and a part of the work done on the imposing stone or table usually consists of imposition. But while not all type forms that are to be printed need to be imposed (if we use the word "impose" in a restricted sense), they must all be placed on an imposing stone or on a smooth, solid surface while being locked up for the press. No type job should be brought to the stone until it has been corrected, properly spaced and leaded, and the final proof has been read and "O. K.ed" by some one in authority. The final proof, in its proper job envelope or ticket, should "travel" with the form to the stone. Small type jobs should be securely tied with a cord before they are brought to the stone. The imposing stone or make-up table should be absolutely free from dirt before the type that is to be locked up is pushed onto it from the galley. The table should be wiped off with a clean rag before beginning to work on it. If the job is a small one, it is best to pick it up and examine the bottom in order to see that there is nothing under any of the letters which may make them stick up higher than their mates.

All forms that are to be printed on a press (other than a hand press or a proof press) must be tightly locked into a metal frame or chase of the proper size. If the form is to be locked up for a platen press, it is generally placed in the center of the chase, with the head toward the left side. Thus, when the form is placed in the press, the type will print with the head nearest to the left edge of the *draw-sheet.*

There are, however, some exceptions to the general way of locking up forms for a platen press. Among these may be mentioned jobs of letterheads in which all the type is to be printed at the top of the sheet, or jobs which have halftones or illustrations running across the top of the sheet. On an ordinary platen press, better ink distribution and a more even impression can be obtained when the type is locked up parallel to the long dimension of the chase. In the case of letterheads the type would be placed up-side down, as shown in Figure 1. But even in the printing of letterheads no rule can be given which has no exceptions. A

6 by 9-inch note-sheet for a social or a professional letterhead would invariably be printed parallel to the long dimension of the chase. The type would, of course, read across the short dimension of the chase, at the left-hand side, as it lies on the imposing table.

Preparing a Form

The best way to lock up a form will depend upon the size of the sheet used, the size of the press, and the style of the composition. A form consisting of a few centered lines is usually locked up to permit feeding the sheet in the *long way*. The relation of the size of the job

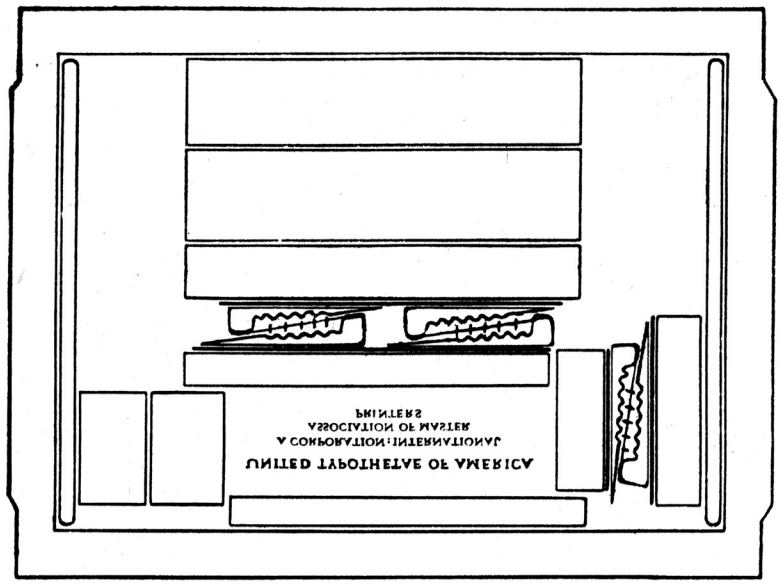


FIGURE 1
How to lock up a letterhead.

to the size of the chase into which it is to be locked must always be considered in determining the way in which the type or other printing surface should be placed in the chase. As nearly all chases are rectangular in dimensions, practically all jobs of rectangular shape must be placed parallel to the long way of the chase, as shown in the diagram on page 236. In all unusual forms it is advisable to consult the pressman who has charge of the press on which the job is to be printed.

The left-hand side of the *tympan* is the most convenient one on which to attach the side *feed-guides,* because the right hand feeds the sheets toward the left side.

Jobs for envelope corners and flaps sometimes require to be locked up toward one side of the chase or up-side down, depending upon the

size of the envelopes and whether or not they are to be printed with flap open or shut. Likewise envelope jobs with line-engravings or half-tones may require special positions.

Still other jobs that may require special positions in the chase when being locked up are those having horizontal or vertical rules within them. If possible, rule forms should be locked up in such a way that the rollers of the press will not strike against the ends of the rules, as this may cut the rollers and injure them.

After it has been determined on which press the job is to be printed, a chase of suitable size must be procured. As the sizes of the beds of

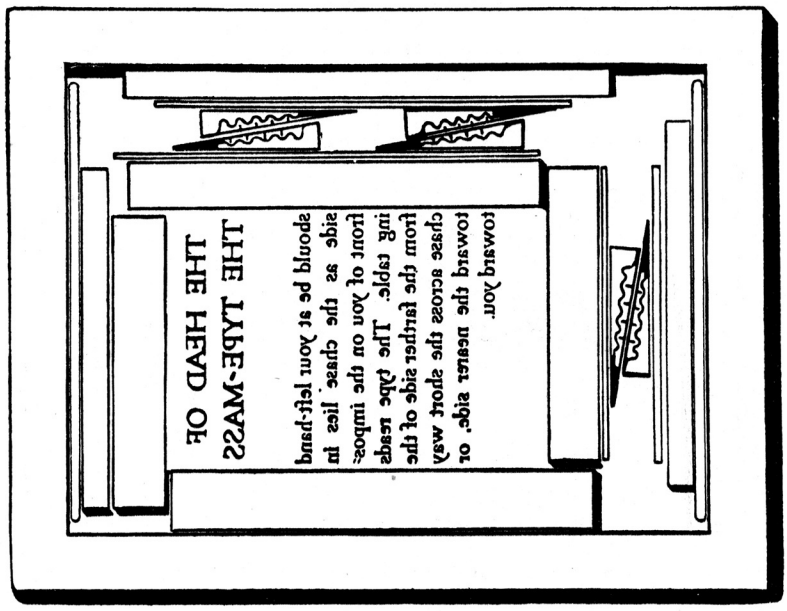


FIGURE 2

How to place bearers, furniture, and quoins. The wooden bearers are on the inside of the chase at the extreme left and right.

presses vary, it is necessary to have different chases for the different presses. Here again the pressman should be consulted.

In locking up forms for a cylinder press it is essential for the stoneman to know the *gripper margin* of the press on which the form is to be printed. A gage showing the exact measurements of the press-bed should be obtained from the pressman in charge. On book forms, the blank space between the type and the outer edge of the chase, at the gripper side, is called the gripper margin. In order to make the proper allowance for this margin, it is often necessary to place wider furniture in the *foot margin,* on the side of the long cross-bar of the chase nearest

to the grippers, than on the other side. This will permit moving the form into a suitable position on the bed of the press. Ordinarily, the lowest folio of a form (the first page) should be placed next to the *gripper edge.*

How to Place Furniture and Bearers

Instruction: Lay the chase around the job of type, which has been pushed or lifted onto the imposing stone, and put the furniture into position. If the job is a single page, and is to be printed in the usual way, lay it so that the top line is at your left hand; then place around it four pieces of furniture of the required length and width; now remove the cord with which the type is tied up. It is sometimes necessary to place a *bearer* at one or both short ends of the chase. Bearers are pieces of metal or wood, about ⅞ inch high, and from 2 to 5 picas wide. They should be long enough to cover the depth of the form, or they may be the length of the narrow dimension of the chase. When the chase is placed in the bed of the press, the bearers will come under the ends of the press rollers and serve as supports while the rollers are passing over the type or other printing surface. They also cause the rollers to turn and prevent them from sliding. Bearers are usually essential for all platen press work, even though the rollers and roller wheels may be perfectly adjusted. Bearers are not used in chases locked for cylinder presses.

Next, fill in with additional pieces of furniture, leaving space enough for quoins and reglets at the farther or top side and at the right-hand side of the form. When locking up a form with Hempel or similar quoins these should be placed so that they will drive or "pull" the form toward the solid part or bars of the chase, against which the type is placed (usually the left-hand and the lower side). At the top the quoins should be turned so that the inside section will point to your left, and at the right so that the inside section will point toward you. If turned the opposite way, they will cause the job to spread apart when the quoins are tightened.

The best results may be obtained when the type or printing plate is in the impressional center of the press, and consequently it must be so placed in the chase. If there is any departure from this rule, due to an unusual shape of a form, let the type-mass be a little below the center up and down.

There are different ways of placing the furniture around type that is to be locked up, but the *overlapping* or *chasing method* in which each piece that comes in contact with the type overlaps the end of the piece that is at right angles to it, is considered best if the job is large enough to fit the chase; and forms should be locked in this manner whenever possible. This method and the *interlocking method* are shown in the accompanying illustrations.

Whenever possible, small forms should be locked up in small chases,

but this cannot be done when the form is small and the sheet to be printed is large. If the chase must be much larger than the form, it is

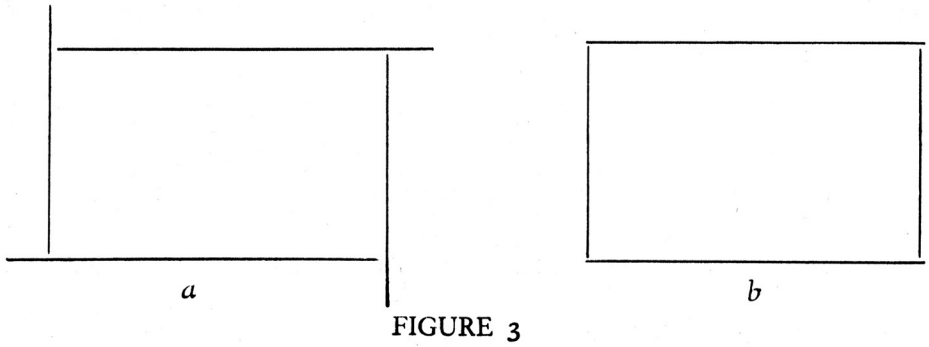


FIGURE 3

A diagram showing *(a)* the overlapping method, and *(b)* the interlocking method of placing furniture in a chase.

best to build out the form by means of metal furniture and slugs on one side or both sides, and at the top or bottom of the type or plate, as shown in Figure 4.

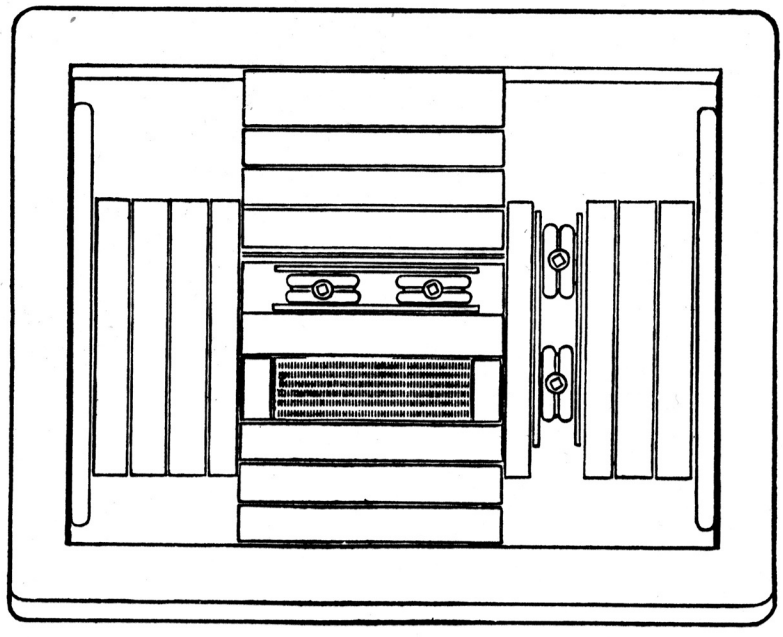


FIGURE 4

Locking up a small form in a large chase.

Handling Rule-Forms

Brass rules which have a fine, sharp printing surface have a tendency to cut the rollers on the press, unless the ends of the rules are protected, or the form is so made up that the rollers will strike the rules the long—parallel—way. Sometimes, when this is not practicable, old rollers are

substituted for those which are regularly used. In some shops so-called *biased* chases are used for locking up rule-forms. These chases are so constructed that the type may be locked up at a slight angle, or diagonally.

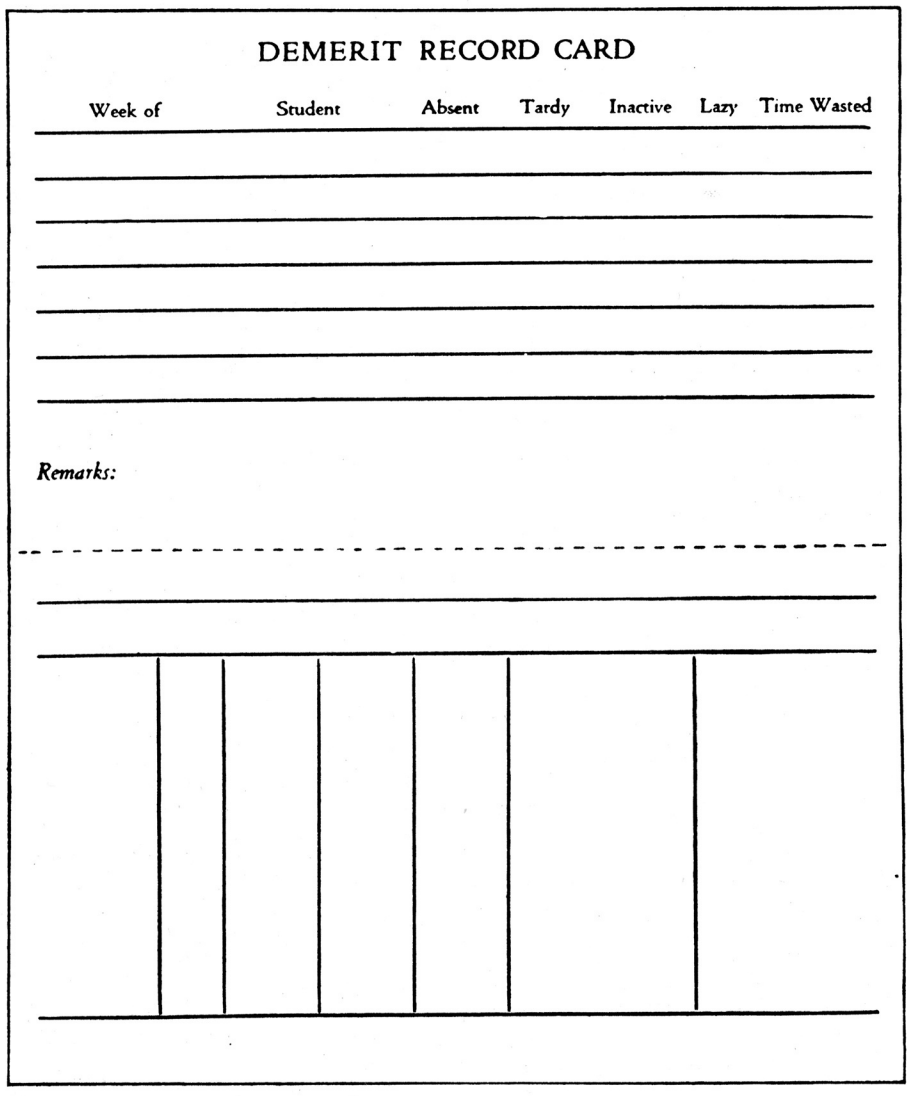


FIGURE 5

A work-and-twist form; slightly reduced in size.

Another way of obviating the danger of injuring the press rollers while printing rule-forms is to use the *work-and-twist method*, in which the form is made up in two sections, both of which are printed at one impression on a sheet twice the size of the one required on the finished job. This method of printing presupposes planning the composition accordingly. Instead of setting both the horizontal and vertical rules in one job, they are set separately, as shown in Figure 5. After going through

the press the first time, the sheet is "twisted" through an angle of 180 degrees (end for end), and printed a second time. This prints the horizontal rules over or alongside the section containing the vertical rules.

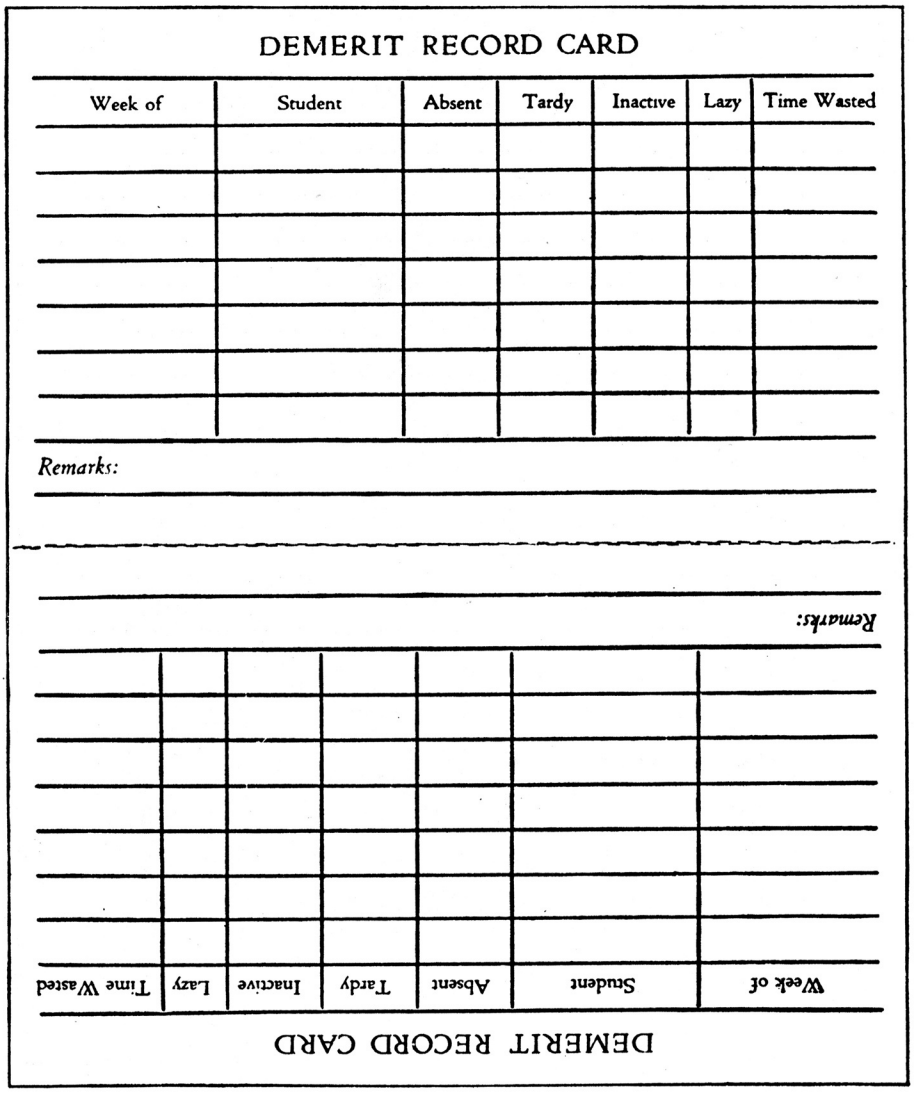


FIGURE 6

The work-and-twist form shown in Figure 5, after being run through the press a second time.

Both halves of the sheet are then alike, and when dry are cut apart, making two complete copies, printed on one side only. (See Figure 6.) This method of printing also produces a better junction of the rules which run at right angles to one another than can be obtained by setting both cross- and down-rules in one job. Bearers should always be used in a chase when locking up a rule-form.

Whenever a rule-form is to be printed by the work-and-twist method, the vertical rules are put in one section of the form and all except two of the horizontal rules (the two outer ones) are placed in the other section. The two outer horizontal rules should be placed at the top and bottom, or at right angles to the vertical rules, thus forming a box with these. This protects the ends of the vertical rules, and will prevent them from cutting the rollers. If the rules run off the sheet, short cross-rules should be placed at the ends of the vertical rules. The form must be made up so that the horizontal rules run parallel to the rollers of the press, as shown in the accompanying diagram.

This method of setting and printing rule-forms is practicable when only a small number of sheets are to be printed. For long runs, both the horizontal and vertical rules should be set in one job. If this appears impracticable from a composition standpoint, the type may be set without rules, proofs taken of it, and the rules drawn in with a lead pencil, indicating which ones are to be heavy and which fine-line rules. The type and the proofs may then be sent to the electrotyper, who makes a *wax-rule electrotype.*

Wax-Rule Electrotypes

In wax-rule electrotypes the rules are drawn in by a machine, which makes all joints perfect, corners square, and all rules uniform in weight, if desired. Rules of any size, single or double line, and as close together and as many of them as are required may be placed around the type. The electrotypes may be had with either a steel or copper face, curved, flat, or blocked. For jobs which require long runs or repeated runs this method is the best and cheapest way to produce commercial, office, and accounting forms, or ruled-border plates. The cost of these wax-rule electrotypes is about double that of ordinary electrotypes, but this additional cost is more than saved in the composition of the job.

Locking Up a Form

Instruction: After the furniture and the quoins have been properly placed, begin tightening the quoins with the fingers (if Hempel or similar quoins are used; for Wickersham or similar quoins a key must be employed). The page-cord must always be removed from the type before lock-up is attempted. The quoins (1), (2) at the bottom of the form (see Figure 7) should be tightened first, and then those on the side of the form (3), (4). The tightening should be very slight at first, with gradual increase of pressure. While the first pressure is brought to bear on the furniture, pass the fingers of the hand over the face of the type to see if there are any letters

sticking up and if all type is squarely on its feet; all letters should be pushed down, and all lines should be straightened before locking up further. Now insert the key in the quoins and tighten the form a little more. This being done, secure a planer and plane down the type gently. By giving the planer a light tap with the quoin-key small forms can be made level, but large solid pages may require a mallet.

Proceed to tighten the quoins further, beginning with those which lie parallel to the type lines, or at the bottom of the job, as lines will compress more from the bottom or up and down than from side to side; then tighten the side quoins; now again the bottom ones. Go from one quoin to the other until the

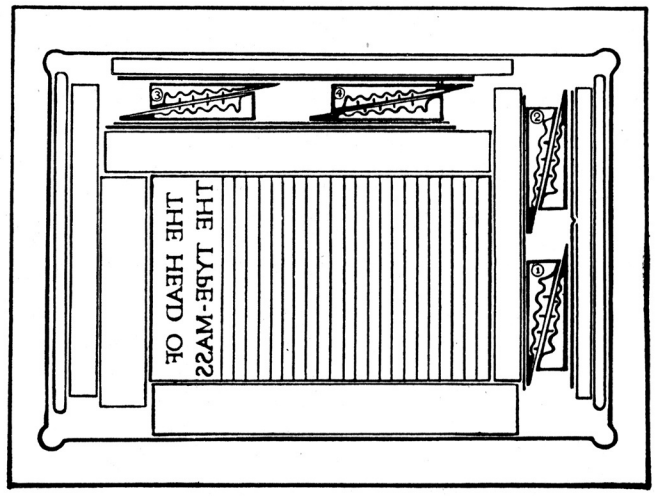


FIGURE 7
Locking up a form for the platen press.

form is entirely tight. Test the form by placing the quoin-key under one end of the chase to raise it from the stone; then try to push the letters down; if they stand up level with the rest and are firm, the form is tight enough. Do not lock a form tighter than is necessary to make it lift. To twist the quoins with such force as to make the type and furniture rise from the imposing stone will make it difficult to get an even impression later, with liability to slur as well as to cause spaces, quads, and other blanks to work up during the press run.

Do not place metal against metal; that is, do not place a metal quoin against the side of the metal chase; a wooden reglet should always separate the quoins from the chase, if these must be placed close to the chase. The quoins properly belong 6 to 8 picas away from the type, but they should be between two reglets. The reglets will prevent wooden furniture from becoming indented from the expansive pressure of the quoins. If the space left between quoins and furniture is too small to permit the insertion of reglets, use strips of cardboard instead. Finally, when the form is completely locked up and is ready for the press, stand it on edge, holding it with one hand, while passing the palm of the other hand over the bottom or back of the type,

in order to rub off any foreign matter, such as grit or pieces of paper, which may have been under the type. The form is now ready for the pressman.

A steel carpenter's square or a transparent try-square should be part of every stoneman's mechanical equipment. This may be used to advantage in testing forms for squareness, especially if they contain pages that are enclosed within rule-borders.

Foundry Lock-Up

Stereotyping and electrotyping are duplicating processes which are advantageous when books, pamphlets, and catalogs are to be printed in large editions, and this also applies to any job of printing of which a large number of copies is required. If only a few thousand copies are to be printed, as in the case of pamphlets, etc., this is usually done from the original type composition. Electrotypes have a copper- or nickel-steel face, which makes the plate more durable than the type composition. Consequently, a much greater number of copies may be printed from electrotype plates than from type before the printing surface begins to wear down. Furthermore, if a duplicate is made from the original type matter, the type becomes immediately available for distribution and reuse in other jobs. And, again, economically, a square inch of foundry type costs more than a square inch of electrotype plate.

Pages of books, magazines, periodicals, and catalogs intended for wide circulation in one or more editions are invariably locked up for electrotype molding in small forms, of one, two, or three pages, usually not exceeding 15 by 21 inches. Halftone engravings, and pages of small type, require more pressure than forms of large type, and they are more easily molded in small forms. Halftones are often taken from their blocks and molded separately in a sheet of soft lead, which is then given a coating of nickel, to make it durable. Finally the lead-nickel type is backed up with metal to give it stability. In shops where electrotyping is the usual practice, the material used in the form varies somewhat from that used where the forms themselves are to be put on the press for printing. In addition to the *high spaces, quads, leads,* and the furniture in the page itself, special chases are employed. There is, however, a great deal of electrotyping done from forms containing the ordinary low material throughout. Of course, *guard-lines* must always be placed around the pages before the form is locked up.

Instruction: The procedure of locking a form for the electrotyper does not vary greatly from that of locking up for the press. A chase should be chosen

to suit the size of the job or page. Put small jobs in small chases and large jobs in large chases. Each job or page should be surrounded with metal *bearers* or guards to bear off the pressure around the edges.

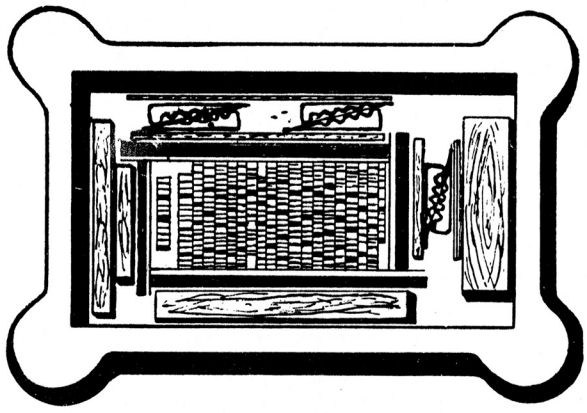


FIGURE 8

Locking up a form for the electrotyper.

When a form is placed in the wax-molding machine an enormous pressure (about 400 pounds to the square inch) is brought to bear upon the type surface, and unless the guards surround it, the type will be injured. Electrotype guard-lines are type-high strips of metal, usually not less than 18 points wide. They have a flange on one side, and this low side should be placed nearest to the type. When so placed, it will leave a clear, white space of from 10 to 12 points between the broad face of the guard-line and the edge of the type-page. (See Figure 8.) This will permit the easy separation or sawing off of the guard-lines in the

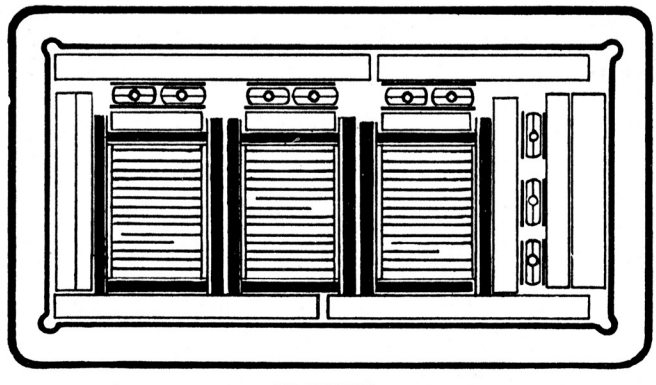


FIGURE 9

Three pages of the same size locked in one chase.

finished electrotype. In a form properly locked for the electrotype foundry, the open spaces should have pieces of guard-line, or other points approximately type-high, to serve as bearers within the form, in addi-

tion to the guards around the page. These protecting bearers are especially important where there are small types or thin rules near the edge of the form. The best quoins for foundry lock-up are Hempel quoins; they are less likely to slip, when graphite gets on them, than other styles of quoins.

Electrotype chases should be stamped with the name of the owner, or some other mark of identification should be placed within the chase, outside of the form. A Linotype slug, with the name of the sender, would suffice to prevent the chase and its contents from being misplaced in the foundry.

Producing High Spaces and Quads

When a form contains many blank or quad lines (that is, much open space), these can be made approximately type-high by turning the form —which must be locked tight enough to lift, but not entirely tight—face-down upon the imposing stone or table, and then pushing the quads through to the level of the type-face, thus producing the effect of high quads. After this has been done, turn the form right-side up, and plane it gently; then lock it securely. Before turning the form the first time, place a thick piece of cardboard on the face of the form, in order to prevent injury to the type when it is turned face-down on the stone.

Guard-Lines and Bearers

Always select guards that come nearest to fitting the job to be locked up. If the job is large enough to offer good bearings for the quoins, the guards may be slightly longer; it does not matter if they overlap, as shown in Figure 9. There is seldom need of cutting guard-lines, as the form may contain more than one section or strip on each side; piece them together if necessary.

In locking up two or more pages, no attention need be paid to the margins between the pages. Only a narrow piece of wooden or metal furniture need be placed between the chase and the type, but when two or more pages are locked in one chase a double-width guard-line (or two pieces turned in opposite directions) should be inserted between the pages to separate them so that the plates of the different pages can be readily cut apart. The high parts produced on the electrotype plates by the guard-lines are trimmed away in the finishing of the plates. The head and foot guards may be the width of the pages in the form, and the vertical guards along the sides of the pages should be made of such length that they will not bind when the pages are tightly locked up.

High slugs should be placed alongside the guard-lines if necessary to fill out space. There should be one guard for each side of each page. This means that there will be two guards between pages. If a page of a book set with low spaces and leads contains but a few lines, a guard-line should be placed beneath the last line of the text.

It is a good custom to test all forms for squareness with a try-square or carpenter's square before they are sent to the press; especially those with a border or those which have horizontal or vertical rules, because any irregularity would mar the appearance of the printed job. Although all jobs for the press should be properly justified, those to be sent to the electrotype foundry need to be justified as well as or better than those for the press; for, if a form is to be wax-molded, the wax will certainly find the weak spots, and the result will be twisted type and rules.

Electrotypes for Several Colors

If the job to be electrotyped is to be printed in more than one color, it need not be made up into separate forms. Lock up the form as if for one color; pull a proof, and on that proof designate what color each part is to be. The electrotyper will make the necessary number of plates and rout away on each what is not needed. Electrotypes to be used with red ink should have a nickel-steel face, because some red inks have a deleterious effect on copper.

It is customary to take two sets of proofs of forms that are to be sent to the foundry, one proof to accompany each form and the other to be placed in the job envelope.

It is very important that jobs for the foundry shall be cleaned thoroughly after the final proofs have been taken. Type and illustrations that are full of dried ink, especially the halftone cuts, will produce poor electrotypes. Nearly every printshop has some special solution or ink remover which is superior to lye or gasoline for taking off the accumulated and dried ink. By means of a fine wire or stiff bristle brush and a good ink solvent, all type forms may be cleaned, but halftones require special care in cleaning so that they are not scratched. When there is any doubt about the coarseness of the brush, the foreman or the instructor should be consulted. Wiping a halftone with a soft rag that is free from grit will do no harm.

Imposition

Forms which have two or more distinct sections or pages require to be imposed. *Imposition* is the act of placing the pages of a form in such

a way that, when the sheet is printed therefrom and folded, the pages or parts of the form will follow in logical order. But imposition deals not only with books; it is also applied to pamphlets and folders.

In the *Dictionary of Graphic Arts Terms* we may read: "Imposition is the operation of laying a number of pages or parts of a form in such a manner that, when the sheet is printed and folded, the pages will follow each other in consecutive order, with proper margins. This part of the printer's work requires experience, skill, precision, and the ability to calculate closely. A single sheet may contain a single page printed on one side, or two pages, one on each side; or it may, after printing, be folded once, and have three printed pages and one blank, or all four pages printed; or it may be intended to fold twice into three leaves with six pages, or into four leaves with eight pages; and so on, with larger sheets and additional foldings."

Pages may be imposed from the outside or the inside, depending on the nature of the type or engravings that are to be printed; blank pages are usually placed on the outside of a *signature,* but sometimes they must be on the inside of the form.

Margins and Allowances for Trim

Margins in imposition are the parts of a form that are filled with furniture, and in the printed sheet they are the blank or white spaces that surround the type-page. To clarify the word still further, we may take as an illustration two companion pages, Figure 10. The white spaces on the left of page 2 and on the right of page 3 are the front or outside margins; and on the left of page 3 and on the right of page 2 are the back, inside, or gutter margins; at the bottom of both pages are the lower, bottom, or tail margins, and at the top are the head or top margins. There is a great variation in the size of margins, depending upon the type-page size and the general character of the printed sheet or book; the larger the leaf of the book, the larger the margins; the smaller the book, the smaller the margins. In good printing, margins are always of unequal size. The lower margins are invariably the widest; the front of the page is next widest; the head third in size, and the back margin is the smallest.

When thick signatures are to be *side-stitched* (wired), instead of *saddle-stitched,* an extra quarter-inch should be allowed in the back or gutter margins, because side-stitching will prevent the book from opening out flat to the full width of the page.

When giving specifications denoting sizes, the horizontal dimensions are given first; that is, if the piece of printing were laid on a table upright, a quarter-sheet of cover stock whose measurements are 13 by 10 inches would indicate 13 as the horizontal dimension and 10 as the upright dimension; given as 10 by 13 would mean the opposite. Sta-

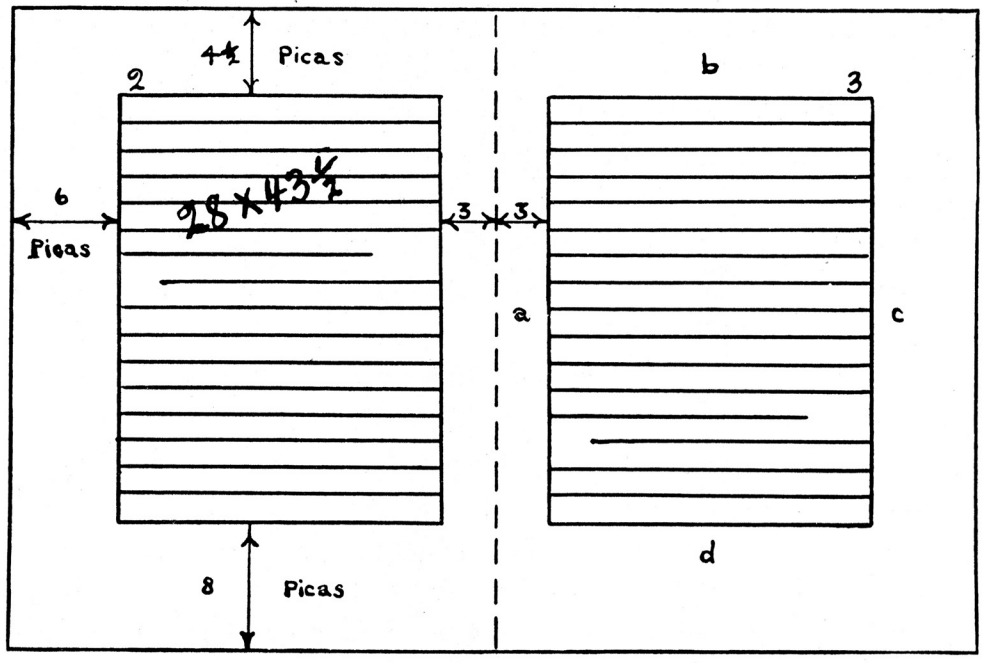


FIGURE 10

The margins on two companion pages: *(a)* back, binding, or inside margins—narrowest. *(b)* head or top margins, equal to back or slightly wider. *(c)* front or outside margins, slightly larger than head margins. *(d)* foot, bottom, or tail margins—widest.

tioners, loose-leaf device manufacturers, and binders give the binding edge first. In the printshop the dimensions given first indicate to the compositor or *layout man* how the printed lines should run—across the long way, or the short way of the sheet.

In all modern printshops a plan or layout accompanies the job envelope, giving the size and proportion of the margins which are to appear on the printed page. It then becomes the duty of the stoneman to make up his pages according to the margins indicated on the stone-layout; but sometimes he makes up according to verbal instructions given by the foreman in charge.

Instruction: The question of trim increases in importance as the number of pages increase. If we take a sheet 25 by 38 inches in dimension, which is the

standard size required for a 16-leaf (32 pages) booklet of 6 by 9 inches, and fold it correctly four times, we have the untrimmed leaf size of 6¼ by 9½ inches. We allow just enough (⅛ inch) trim on the top to sever all *bolts* and *folds* and secure a clean cut. Give the bottom a larger trim (⅜ inch) allowance because there is always greater irregularity at the bottom than at the top of the sheets. Allow for an even division of the trim (¼ inch) margin on the front, but no trim need be allowed at the back. In trimming, the signatures should be jogged at the head and back and pushed tightly to the gages of the paper-cutting machine. The fore-edge or outside is trimmed first, then the tail or bottom edge, and the head or top edge is trimmed last. (See Figure 11.)

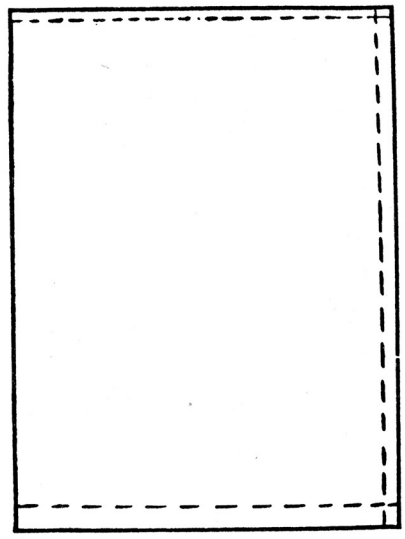


FIGURE 11

A 25 by 38-inch sheet, folded down to 6¼ by 9½ inches (shown relative size, greatly reduced). Trim allowance is indicated by dotted lines.

In many modern binderies, pamphlets, catalogs, magazines, and other periodicals are stitched before they are trimmed. This makes it possible to trim all three sides at one time. A pile of signatures or pamphlets, up to about ten inches high, is put into the cutter, and these are trimmed in one downward thrust of the knives.

Variable Margins on the Imposing Table

The matter of variable margins is frequently ignored until the form is on the press, and then pages are shifted first in one direction and then in another. This is not a practical way of regulating the margins. Most of the work of apportioning the margins between the pages should be done on the imposing table. An explanation which may aid in the accomplishment of good work is useful here.

Assuming, by way of illustration, that we must lay a thirty-two page form for a catalog, imposed from the center (for a Dexter periodical folder), to be printed on fairly heavy book paper—25 by 38, 80-pound weight, coated. In order to have our catalog come back from the bindery with correct margins, the first precaution must be taken in the composing room, or on the imposing table, where the margins are made up. These must be graduated to suit the thickness of the paper upon which the work is to be printed. (Very thin paper, in signatures of eight to sixteen pages, need not be so considered.)

Instruction: After the correct head margins have been decided upon, two points more should be placed between the heads of the pages which lie toward the inside of the form, namely pages 1 and 16, 2 and 15, 3 and 14, 4 and 13, 17 and 32, 18 and 31, 19 and 30, 20 and 29, than between the remaining sixteen pages. Inversely, after determining the proper back margins, the space between some of the pages must be gradually reduced. Between the backs of pages 1 and 32, 2 and 31, 3 and 30, 4 and 29 there should be the determined amount of space; but between pages 5 and 28, 6 and 27, 7 and 26, 8 and 25 the space should be reduced 2 points. Between pages 9 and 24, 10 and 23, 11 and 22, 12 and 21 the space should be reduced 4 points, and between pages 13 and 20, 14 and 19, 15 and 18, 16 and 17 the space should be reduced 6 points. This plan of graduating the margins applies to sheets which are to be folded by four right-angle folds. The variable margin allowance is made necessary because of the folds in the paper; that is, two leaves of four pages are nested into two others, and these, in turn, are again nested into the next two leaves, until, finally, when the catalog is stitched and trimmed, eight sheets of paper, of four pages each, are nested one into another. The thickness of the saddle of this quaternion is about equivalent to 6 points.

Whenever it is practical and possible to do so, heavy paper should be printed in a double-sixteen rather than in a thirty-two-page form.

Another method, accurate and simple, for determining how much the margins should vary for the different pages of a book or pamphlet is as follows:

Instruction: Take a sheet of paper of the stock on which the work is to be printed, and fold it exactly as it will be after it has gone through the press, being careful that all edges are firmly and evenly folded down. On the first page draw a rectangle or pencil frame the exact size of the type-page that is to be printed thereon, and with a knife or bodkin stab through the folded sheet at the four corners of the pencil frame. The holes in the successive leaves will indicate how much to graduate the margins. The sheet may now be unfolded and used as a guide in apportioning the margins as the pages are being imposed. Pencil lines may be made from one hole to the other, thus showing the dimensions of all type-pages.

Mechanical line-up and registering devices are used to some extent in shops which print pages in multiples, as must be done in producing pamphlets, catalogs, magazines, and books, from type, electrotypes, or stereotypes. The purpose of a line-up system is to provide an accurate layout or imposition diagram of measurements for the make-up man, stoneman, line-up man, and pressman, by showing: for the stoneman, the exact size of spacing material for the backs, heads, and gutters of his pages, including the trim; for the line-up man, the measurements for lining up *strike-sheets* before going to press; and for the pressman, the

distance from the grippers and side-gages to strike the form. Some line-up and registering systems can be applied directly to the surface of the imposing stone, thus showing the marginal measurements direct on the form. As a great deal of the book-printing today is done from plates

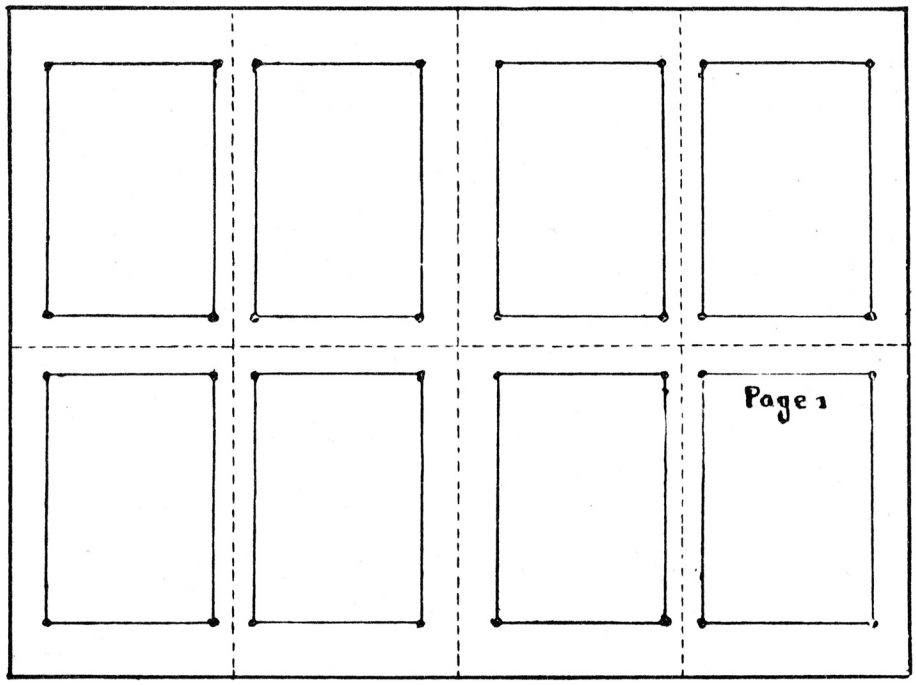


FIGURE 12

A 16-page blank folder which has been stabbed and then spread out to show the margins for the pages.

which are attached to metal bases of one style or another, there are line-up devices suitable for getting the pages into the correct position on these bases.

Although the method of procedure differs in the operation of the various devices, their ultimate aim is the same: to facilitate and improve the work of the stoneman and the printer in general.

Various Schemes of Imposition

Many different schemes of imposition are required because of the various sizes and shapes of paper, or the size and kind of press to be used. The three most common ways of imposing pages are: The *sheet-wise* method, which was used by Gutenberg and the early printers, when all printing was done on small hand presses; the *work-and-turn* method, which did not come into general use until the 19th century; and the *work-and-tumble* method, which is usually called a "tumble"

sheet, and in a broad sense is also a work-and-turn method. (See Figure 13.) The different kinds of forms are explained as follows:

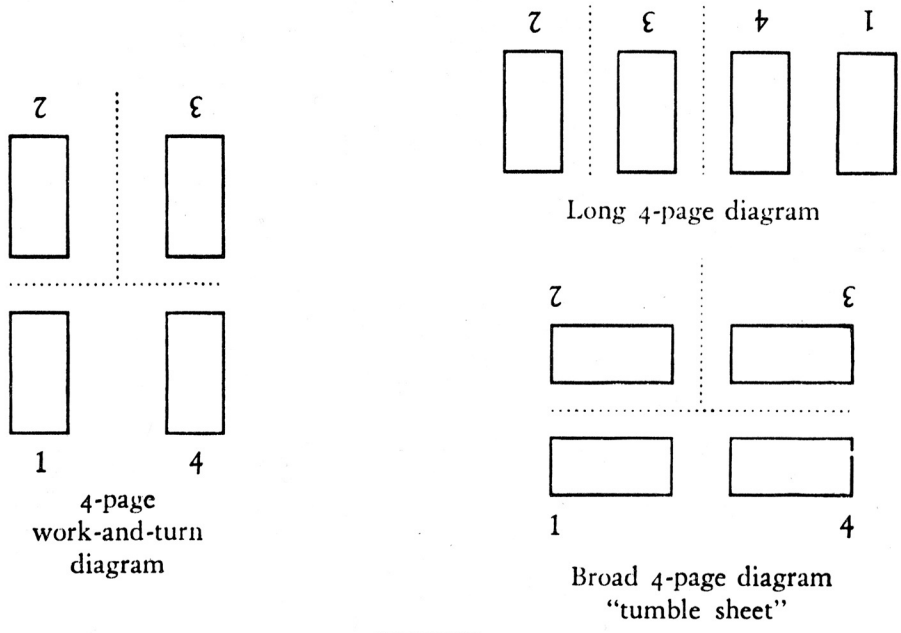


FIGURE 13

SHEET-WISE. The two sides of the sheet are printed from different forms, the second form properly backing up the first. The printed sheets are not cut in two unless two or more separate signatures are printed, that is, printed two-on, three-on, or four-on, as the case may be. The sheet is turned from the feeder, and the end-guide is changed, as in the case of the work-and-turn form. This kind of form is sometimes called a *work-and-back*.

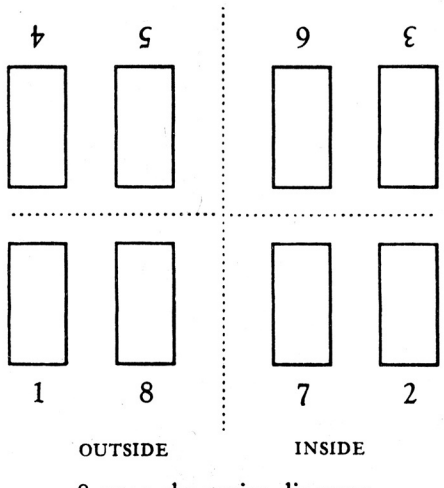


FIGURE 14

In a sheet-wise signature of eight pages, one side of the sheet is first printed with one set of pages, as the first, fourth, fifth, and eighth pages, which are on the outside; and then the other side is printed with another set of pages, the third, second, sixth, and seventh, which are on the inside.

A simple method used by stonemen in ascertaining the outside and inside sections of a form is by canceling every alternating pair of pages, beginning with the second page of the form. The first and last pages are

always in the outside form. The pages composing the inside and outside sections are thus determined:

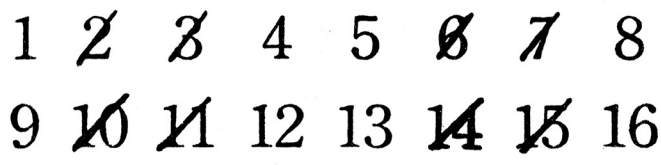


FIGURE 15
Canceling pages for the inside form.

As printing reverses the position, the left-hand page in the form will be the right-hand page on the printed sheet. Anyone may recall that the odd folios or pages of a book always are on the right, and the even ones are on left-hand pages, but in stonework it is the reverse—even to the right, odd to the left. On all odd pages the type reads from back to front, and on all even pages from front to back.

WORK-AND-TURN METHOD. The pages for both sides of the sheet are imposed in the same form and are printed in one operation. When the ink on the first impression is dry, the sheets are turned over, end for end, that is, from the feeder, and the *end-guide* is changed from the far side to the near side. The sheet is then printed on the reverse side from the same form and is cut in two, either by means of a slitting attachment on the press, or, when dry, on the paper cutter. Each half of the original sheet is thus printed exactly like the other half. The same short edge is fed to the end-guide which is changed from far side to near side, and the same long edge is fed to the *front-guides*. When sheets are not of uniform size, it is impossible to obtain perfect register on the *back-up* unless the *push-guide* is used for one side and the *pull-guide* for the other side. The work-and-turn method is sometimes called a *flop-sheet,* or a *half-sheet.*

In a four-page work-and-turn form all the pages are printed at one time on a sheet which is double the size that is required for four pages. The first and fourth pages are laid alongside of each other, and the second and third are made companion pages. The sheet so imposed is sometimes known as a half-sheet, because it produces, when printed on both sides, eight pages, four of which are duplicates. This is accomplished by first printing the sheet on one side, and then, after the ink is dry, turning it upside down and end for end, on the "long cross," which operation causes page 2 to print on the back of page 1, and page 3 to print

on the back of page 4. The work-and-turn form is also called a form that *backs itself*.

In a work-and-turn form the gripper-edge on the sheet (on a cylinder press) or the lower *feed-gage* edge (on a platen press) does not change when the sheet is turned; but the feed-gage edge (on a cylinder press) or the *side feed-gage* edge (on a platen press) does change when the sheet is backed up.

Work-and-Tumble Method. Both sides of the sheet are printed from the same form, just as is done in a work-and-turn form, but the sheet, after the first printing, is turned in the other direction, that is, edge for edge toward the grippers, the same *short edge* remaining toward the feeder. The end-guide is not changed because the same edge is fed to it, but opposite *long edges* are fed to the *front-guides*. To secure accurate register on the back-up with a work-and-tumble form, the stock must be carefully squared before printing.

In the work-and-tumble form the pages are so imposed that the sheet must be "tumbled" or turned on the "long cross." In this case the *gripper-edge* only changes, and on a platen press the *lower feed-gage* edge only changes when the sheet is run through the press the second time for backing up. It is more difficult to obtain exact register by turning a sheet on the "long cross" than on the "short cross" (short cross-bar of the chase). This style of form, because it makes necessary a new feeding-edge, may compel the pressman to register to *points*, which is a relatively slower process than when the sheet is turned end for end and is then fed to the same feeding-edge. Tumble sheets are, however, sometimes unavoidable.

Work-and-Shift Method. Occasionally certain considerations in connection with the folding of the signature, or otherwise, make it necessary to transpose or "shift" some pages in the inner section of a form in order to secure correct back-up in the second printing. Aside from the shifting of the pages, the form is printed as in either the work-and-turn or the work-and-tumble method.

Work-and-Twist Method. This term is applied to work printed with two impressions on the same side of the sheet. In forms of blank tabular work with rules running in both directions, a better-looking job can be obtained by making up the form in two sections, one with the horizontal rules and the other with the vertical rules. Both sections are printed at the same time. After the first printing, the sheet is "twisted" or "whirled" through an angle of 180 degrees, that is, turned end for

end, and printed the second time, one form thus being printed over the other. Both sections of the printed sheet are then alike, and are afterward cut apart. The *end-guide* must be changed in order to feed from the same edge of the sheet at both impressions, but opposite edges are fed to the *front-guides*. Stock must be carefully squared to secure perfect register. The name *work-and-whirl* is often given to this kind of form.

The student-printer may become familiar with a few of the many styles of imposition by an examination of the diagrams printed in this chapter. The greater the number of pages to be printed at one time, the more difficult becomes the job of imposing them. The thickness and quality of the paper, the size and the dimensions of the page, the nature of the composition, the method of folding the sheet, and the style of binding required—all these must be given consideration in deciding upon a scheme of imposition.

How to Make a Diagram

Imposition, like all the other work of the printshop, requires careful thought and planning. Before the student pushes the pages intended to make up a form onto the imposing stone, he should make a *diagram* or *blank folder* of the imposition scheme or *stone-layout* that he is to use.

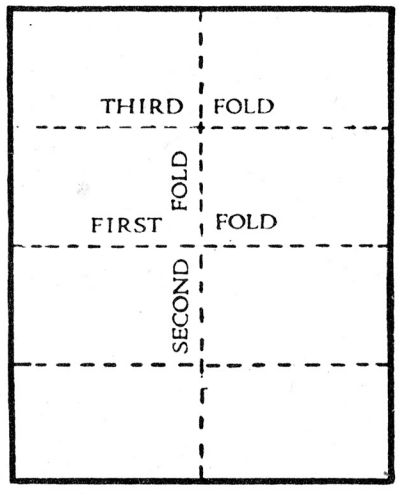


FIGURE 16
A diagram showing three right-angle folds.

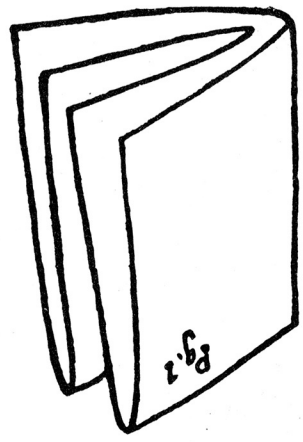


FIGURE 17
A blank folder for an 8-page form.

This is done by securing a sheet of paper of the required size (one may practice with a small sheet at first) and folding it over and over through the narrow diameter, or otherwise, until the right number of pages of the correct size is produced.

Instruction: Place the blank sheet before you on a table, with the longer edge of the sheet parallel to the edge of the table which you face. Turn the right-hand half of the sheet over to the left and fold it in the center, producing a crease that is vertical to the near edge of the table. Now draw the sheet toward you with your right hand until the first folded edge is parallel to the edge of the table. The longer dimension of the sheet will again be parallel to the table's edge nearest you. Fold the sheet in the middle as before. You now have made two right-angle folds, which produces a blank folder of eight pages. (See Figure 17.) Each additional fold through the middle would double the number of pages. The closed bolts indicate the heads of the pages, and you must turn the blank folder completely around before beginning to number the pages.

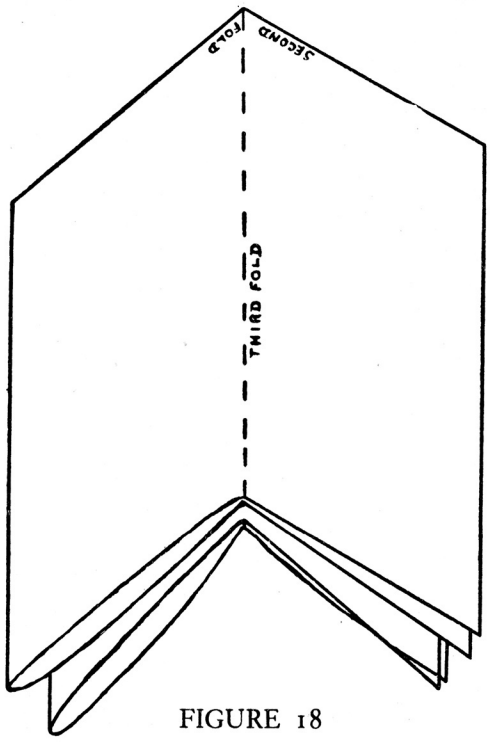


FIGURE 18

A blank folder, produced with three right-angle folds.

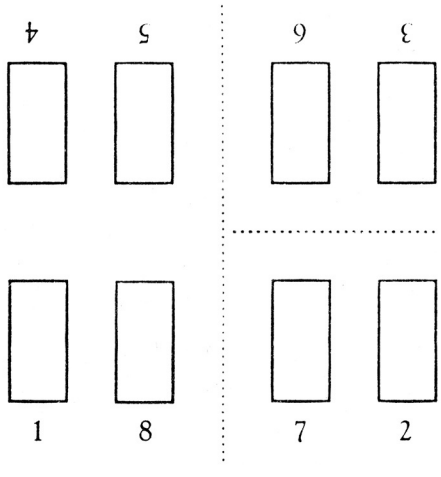
Numbering the Pages: If the *sheetwise* method is to be employed, number the first page on the outside 1, and continue with 2 on the next page, numbering the pages consecutively through the folder. When this is unfolded, it will have half the pages on one side of the sheet, and half on the other. The side containing the first and last pages is the layout for the *outer form;* the other side contains the pages for the *inner form*. By unfolding and placing the blank and numbered sheet face-down on the stone, it will indicate the relative positions of the type-pages. The number of pages on the sheet must conform to those that are to be laid on the stone, in the chase.

All schemes of imposition shown in this book, and in other books also, are illustrated by means of diagrams or stone-layouts. A diagram indicates how the pages lie on the stone, and not how they appear on the printed sheet. Do not confuse a diagram with a dummy. In imposition, a dummy is a plan of the printed sheet, and is the reverse of the diagram. The beginner at imposition should always have a definite plan of the scheme of imposition that he is to use.

For a *work-and-turn* form, the sheet to make the blank folder should be double the size of that required for a sheet-wise form of the same number of pages. Make the diagram and blank folder for an eight-page work-and-turn form as follows:

Instruction: Fold the sheet as explained on the previous page, but make three right-angle folds instead of two, in order to produce sixteen pages, instead of eight as in the sheet-wise scheme. Cut the bolts or folds an inch or two at the top and sides to permit opening wide enough to write the page numbers in their proper places at the outside edge of the pages.

In numbering the pages, begin with 1 on the first outside page; skip the next two pages, and mark 2 and 3 on the fourth and fifth pages; skip two more and mark 4 and 5 on the eighth and ninth pages; mark 6 and 7 on the twelfth and thirteenth pages; skip two again, and mark 8 on the last page.



8-page work-and-turn diagram

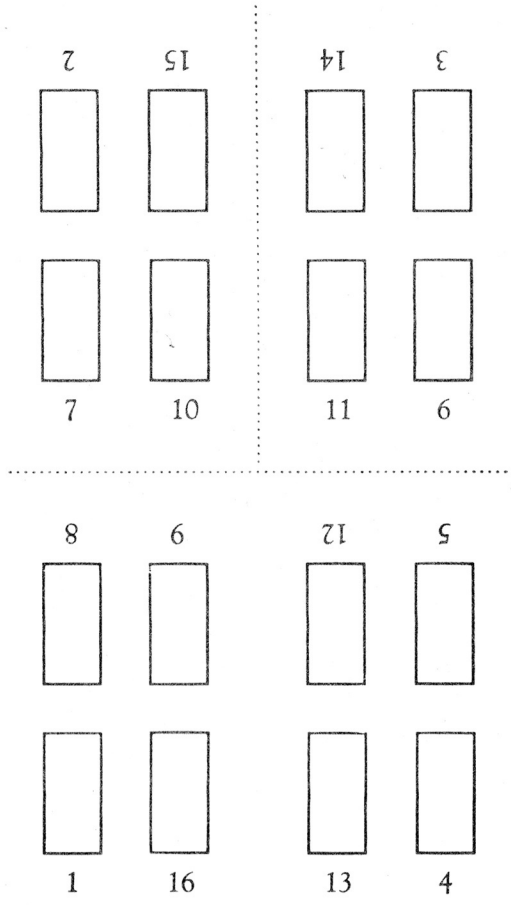
FIGURE 19

This produces a folder showing all eight pages on one side of the sheet. Spread the sheet out, and mark the same numbers on the opposite side, putting —2 back of 1 and —7 back of 8; —8 back of 7 and —1 back of 2; —4 back of 3 and —5 back of 6; —6 back of 5 and —3 back of 4. (Place a dash before or after the second set of numbers, thus: —3.) Observe that 2 and 7 and 8 and 1 are companion pages, and add up one more than the total number of pages in the form. When this sheet (with the — numbers) is laid face-down on the stone, it will indicate where to place the pages of type or electrotypes that are to make up the form. Turning the sheet end for end upside down will make the form back up properly.

If the sheet is not spread out, but is left folded, then the numbers go on the blank pages as follows: Beginning from left to right, or with the second page (back of the first outside page, which has 1 marked on it), —2, —1, —4, —3, —6, —5, —8, —7. The two closed bolts will have to be cut open an inch at the bottom to permit numbering.

A method of making a blank folder for a regular 16-page work-and-turn form is to fold a sheet of the required size by making four right-angle folds, and then to cut the bolts of the right half of the folder. Begin numbering on the first or outer page of the folder. Mark 1, 2, on the first and second

pages, and repeat 1, 2, on the next two pages. Keep on duplicating two pages —3, 4; 3, 4—in arithmetical progression, until all pages are numbered. This will produce a 16-page folder, the folios appearing on both sides of the sheet. If the sheet is placed on the stone, the side touching the stone will be a diagram of the position of the pages as they should lie in the chase. The upper side of the diagram shows the pages which back up when the sheet is run



16-page work-and-turn diagram

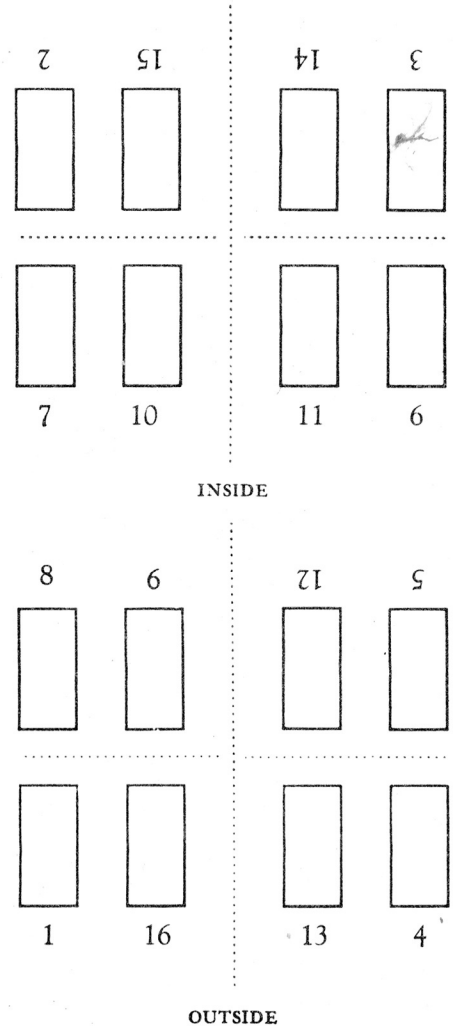
FIGURE 20

through the press the second time. Of course, the sheet is later cut in half, and produces two complete copies.

After a sheet has been numbered to show the position of the pages, a simple way to obtain a stone-layout or diagram is to place a piece of carbon paper under the sheet, and with a pencil trace the page numbers through. This will show carbon impressions of the numbers on the reverse side of the sheet, and these indicate the position of the pages on the imposing table.

By viewing the diagram of an 8-page work-and-turn form on page 257 and the two following pages, the student will see that all pages have

a definite relation to one another; in adding the numbers or folios on any companion pages—those lying alongside each other—a total of one more than the number of pages in the signature is obtained, namely: 1 plus 8 equals 9; 4 plus 5 equals 9; 2 plus 7 equals 9; 3 plus 6 equals 9. This is true in all ordinary schemes of imposition, whether the number



16-page sheetwise diagram

FIGURE 21

of the pages is large or small. In some special schemes of imposition, this rule does not hold good.

The manufacturers of folding machines supply, gratis, miniature dummies of the different schemes of imposition which can be folded on their machines. The student of imposition will do well to secure a set of these dummies and study them carefully.

What is a Signature?

As the word signature is often used in imposition, it is necessary to have a good definition of it. A *signature* is a sheet of printed (sometimes partly unprinted) pages, and this sheet, when folded over and over until in length and width it is the size of one untrimmed leaf, becomes a unit of a book. A signature may also be termed as many pages of a book as are bound or stitched in at one time; as many leaves as the binder folds together at one operation. The inventor of the signature is said to have been Antonio Zarotti of Milan, Italy, about 1470. The early printers signed their names to each sheet of printed pages, and thus the term signature was derived.

Johannes Kölhoff (John Koelhoff), the elder, one of the early Cologne printers, in a book issued in 1472, was the first to use printed sig-

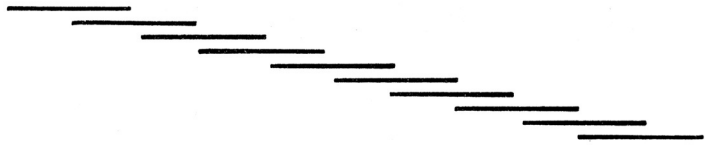


FIGURE 22

A method of producing marks on signatures to aid in collating.

nature numbers on the quires for the guidance of the binder. Before that time, printers were accustomed to signing their signatures by hand.

Theodore Low DeVinne, in *Modern Methods of Book Composition*, made the following statement:

"Bookbinders need signatures [letters or figures] as guides to the orderly arrangement of the different sections of the book. Paging figures in the upper corner of the leaf are unhappily placed for the convenience of the gatherer, who needs the guide at the foot of the leaf, where the section is first seized. The sequence of guide-marks made by alphabetical letters, or by figures following in numerical order, is more quickly seen than the sequence of page figures that have to be compared with the pages of a preceding section. American printers prefer Arabic figures for signatures, for they can be protracted indefinitely for the largest book. . . . If the section has an *inset,* cut off and separately folded and inserted, this cut-off inset should take the same figure as its *outset,* with the addition of a star, thus: *outset 2, inset 2**. When the book makes two or more volumes, the number of the volume must be specified in the signature-line, as in *Vol. II, 2.* The numerals defining the volume should be in capitals, so that they may not be confounded with the Arabic figures of the signature."

From DeVinne's definition, it can be seen that the word signature had, during his life, and still has, in some shops, a dual meaning, but the tendency today is to restrict the use of the word to designate a section of a book or pamphlet. The first page of this section is called the *signature page*. A large form of small pages often contains two or more signatures, which are cut apart after printing; in this case the first page of each part, having the signature letter or number, is termed the signature page.

Collating Marks

The system of marking signatures by means of numbers, which was used during DeVinne's days has been largely superseded by other methods, in which *collating marks* are used. On account of having the work of gathering and folding of signatures done by mechanical means, signature numbers are now rarely required. A method of marking signatures used in many shops is the placing of a piece of brass rule or the like in the gutter margin of the form, between the first and last pages of the sheet. The rule is inked by the rollers of the press, and leaves a collating mark on the back of the folded sheet. The first signature has the mark well toward the top, the next signature has it a little farther down, and the others still farther down at regular intervals. When the signatures for a complete book are gathered, their backs will show a series of these marks. (See Figure 22.) A missing signature will be noted by the absence of its mark in sequence, and a transposition or doubling of signatures will show an irregularity in the sequence of marks.

Advantages of the Different Methods of Imposition

The work-and-turn method is usually the most practical one whenever only a small number of pages are ready for the press at one time; it is also less difficult to obtain exact register in printing a form that backs itself (as is done in the work-and-turn), because the same type, or plates, furniture, bases, chase, etc., are used in printing both sides of the sheet, than when two forms of different pages are used; evenness of color is facilitated when printing from one form on one press; if sheets are accidentally spoiled in backing up, more can be printed before the form is taken off the press; there is little chance for variation in the tightness of the lock-up when only one form is used for both sides of the sheet.

The sheet-wise form method can be used to advantage when many pages are ready for the press, so that two complete forms may be made

up for one or more presses; it is used to advantage on rotary presses which print the sheet on both sides at one operation; it is used for very large pages, and for illustrated work, which require that the ink on one side of the sheet be entirely dry before the other is run through the press. The sheet-wise method is usually followed in the printing of books, catalogs, etc., from plates, thus allowing one side of the sheet to dry before it is backed up. This method is also the best to use when only a small number of sheets are to be printed from one form.

Folding the Sheets

If the number of pages imposed and the quantity of sheets printed are small, the sheets are usually folded by hand. The customary way is to fold the sheet through the short center, bringing the two ends which are farthest away from each other together, and continuing to fold at right angles until but two outer and two inner pages show. If no diagram or dummy has been furnished, it is advisable to get a folded sheet from the foreman of the bindery.

Hand-folding is done on a table, which is covered with clean paper. To facilitate the folding of the sheets by hand, bone folders or steel combers are useful. These are made in various sizes and shapes, to fit the hand and the kind of paper to be folded, and may be bought at printers' or binders' supply houses.

Folding Machines

In order to impose his pages intelligently, the stoneman or the person who makes the diagram for the scheme of imposition should know something about folding machines. More than nine-tenths of the folding of sheets for circulars, pamphlets, and books is done by mechanical means on folding machines. Of these machines there are several kinds, in the manufacture of which two distinct mechanical principles are involved. Two widely different types of machines are the Cleveland, which employs corrugated steel rollers and slotted grids to fold the sheets, and the Dexter, which employs rollers, knives (with saw-points to push down the sheets), and tapes. Both machines have perforating knives which cut or slit the folds in order to allow the air to escape. The Dexter, Chambers, Brown, Hall, and several other machines are called tape-folding machines; the Cleveland, American, Liberty, and several others are called loop- or buckle-fold machines.

The Dexter standard jobbing folder, 189-A, makes thirteen different folds adapted to work-and-turn and sheetwise forms, producing, from flat sheets having a dimension of from 12 by 16 to 39 by 52 inches, from four pages in one fold, up to thirty-two pages in four right-angle or three right-angle and one parallel folds.

The Dexter double-sixteen and double-thirty-two, with attachments, will fold from sixteen to sixty-four pages, the flat sheets ranging in sizes from 26 by 29 inches up to 53 by 74 inches. These double-sixteen and double-thirty-two (Quad) folders are used mostly on book and maga-

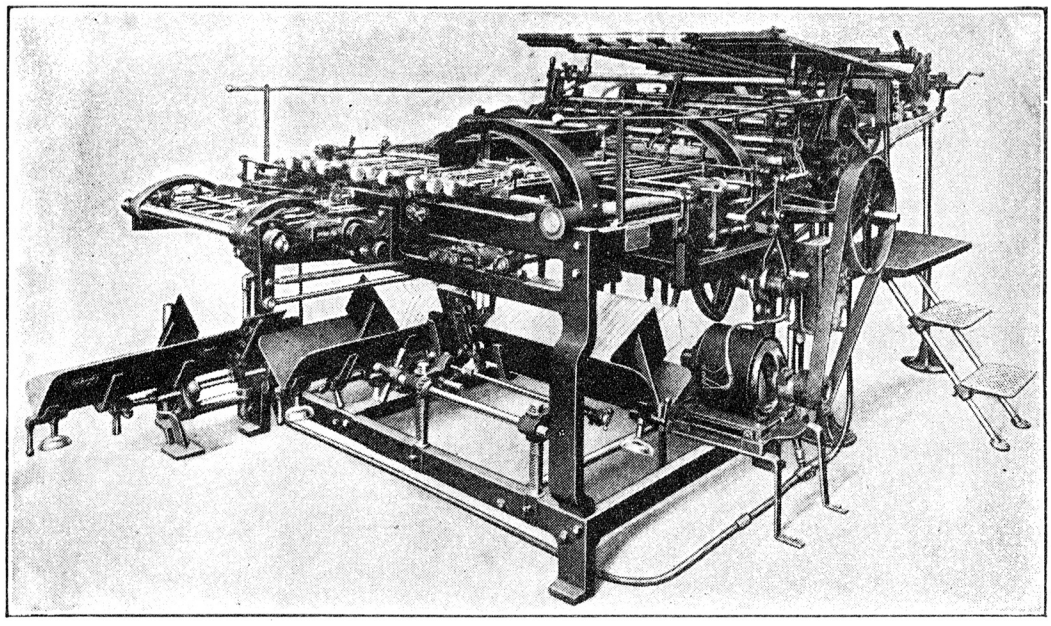


FIGURE 23

The Dexter 189-A Multifold Folder, with Cross Continuous Feeder; maximum sheet-size 39 by 52 inches.

zine folding. The former will produce sixty-four pages, consisting of two 32-page signatures, or two separate 16-page signatures, while the latter will produce four separate 16-page signatures, or two 32-page signatures, consisting of inserted sections of sixteen pages each. Not more than five folds—either right-angle or a combination of right-angle and parallel—are required for any of the seventeen different plans of imposition which can be folded on this machine.

The Brown and Chambers machines do similar work. The largest Cleveland machine takes a maximum sheet of 39 by 52 inches, and there are other models to handle sheets as small as 6 by 6 inches up to 20 by 26

inches, which operate at high speed on both parallel and right-angle fold work.

It is well to consult the bindery—where the folding is to be done—before laying pages for any large form, as some of the folding machines used in the commercial pamphlet and book-binding houses require special plans of imposition.

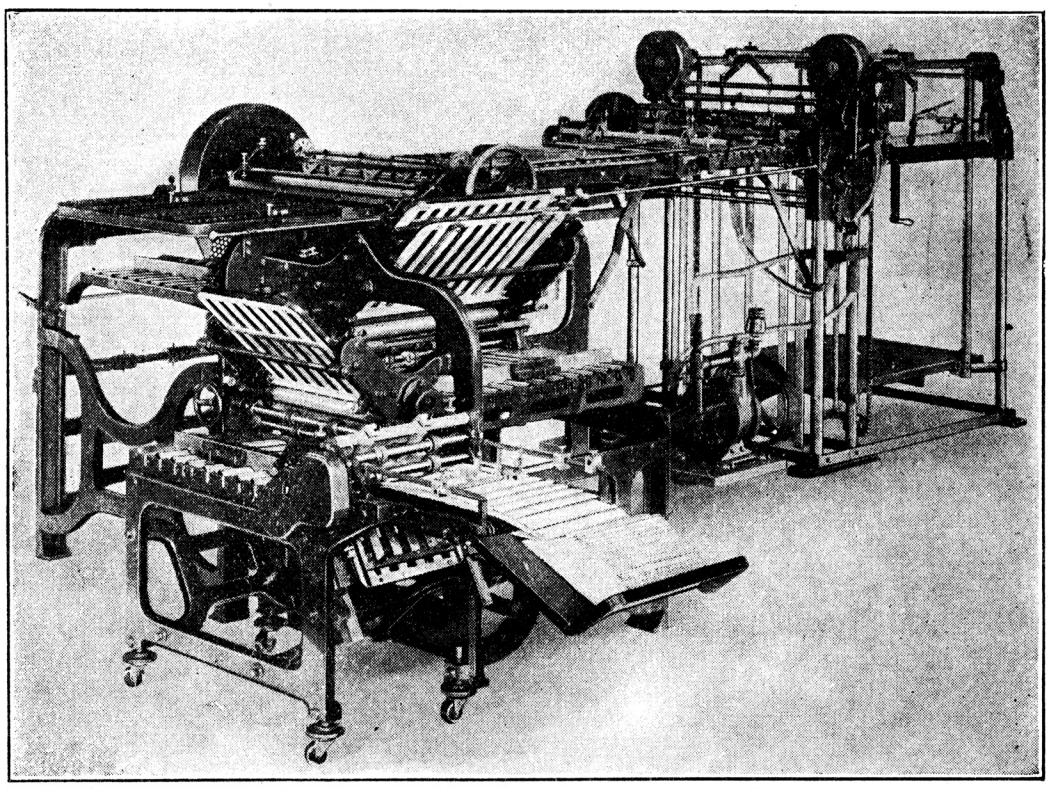


FIGURE 24

The Model "M" Cleveland Folder, with Cleveland Suction Pile Feeder; maximum sheet 26 by 40 inches.

The standard method of book-page imposition is a form of sixteen or thirty-two pages. If the book is printed on heavy paper, special care must be exercised so that gussets and air pockets are not formed in folding the sheet.

Some binderies advise against the use of imposition schemes which require more than 16-page signatures because of the likelihood, especially on heavy paper, of "crow's-feet" or buckles in making more than three folds.

CHAPTER XVII

BOOK COMPOSITION AND THE MAKE-UP OF A BOOK

Book Composition is that kind of type matter which is intended to be printed in books. It consists largely of plain paragraphs of uniform width, set in any desired size of type, usually from 8- to 18-point. Smaller sizes than 8-point and larger ones than 18-point are rarely used. The most common sizes for ordinary books are 10-, 11-, 12-, and 14-point, set solid, single, double, or triple leaded. The composition for nearly all ordinary books is set on composing machines; and the sheets are either then printed direct from the type, when the edition is very small, or from electrotypes, stereotypes, etc., when the edition is to be large; electrotype printing of books is the prevailing practice. Also there are today few printshops in which many pages of body type are set by hand.

In regard to book composition, very little can be added to that which has already been said about composition in general. There is no essential difference between book composition and other kinds of composition so far as the compositor is concerned. Whatever difference there may be, is largely one of style in the use of capitals, small capitals, italics, in the indention of paragraphs, and in the capitalization of the different words in the text. Critical examination and comparison of several good books will show a variation in type-faces, indention of paragraphs, spacing between lines, capitalization, placing of folios, etc. It is advisable for the student to observe these points carefully while reading books.

The Make-Up of a Book

Not all printers' apprentices will be called upon, even in later years, to lay out, make up, and impose book pages, but it is well for every printer to have at least a fair knowledge of the methods used for bookmaking. This brief description of the typography and physical arrangement of printed books is therefore interesting and useful.

The title page, preface, table of contents, and similar "front matter" of a book serve a very necessary purpose in presenting to the prospective reader an outline of the text which is to follow and the manner in which

it is treated. In many cases the presence of some of these features may appear to be whimsical and of questionable service; in other cases the omission or inadequacy of some one feature, especially in a work of many pages, may prove a defect in the volume. The prospective reader of a book is entitled to some guide-posts, which will give, upon preliminary examination, a reasonably clear conception of the subject matter, its chief topics, arrangement, etc. In the well-made book these guide-posts should be arranged with modest sufficiency and order, not over-prominent and without much flourish of detail, but suggestive of the ampler story beyond. Without a doubt, a book is enhanced in value when its introductory matter is judiciously arranged.

A good arrangement of the first pages of a book will be governed by the character of the work: its brevity or its length, its particular subject matter; whether story, essay, reference book, catalog, or other work; by its arrangement of chapters and sub-headings, and other features.

A leaf of a book has two pages, the odd and the even, or *recto* and *verso,* as they are termed by bibliographers. This distinction between a leaf and a page should be kept in mind to avoid misunderstanding in speaking of the make-up of a book.

The order usually followed in pasting up a dummy for a printed book is given below. Each new part or section of the book always begins on a right-hand or odd page. The parts which are continued, that is, those which occupy more than one page, may run over onto the second or third page if necessary.

Cover	(a) title
	(b) pasted end-paper
Fly-leaf	(a) blank
	(b) blank
1st leaf	(i) bastard title
	(ii) blank page, or advertising card, if required
2d leaf	(iii) blank page
	(iv) frontispiece (if any)
3d leaf	(v) general title
	(vi) copyright notice, printer's imprint, etc.
4th leaf	(vii) dedication, if any
	(viii) blank page

NOTE: If there is no dedication on page vii, the preface begins on this page and all succeeding pages bear corresponding numbers.

5th leaf	(ix)	preface
	(x)	preface continued, or blank
6th leaf	(xi)	contents table
	(xii)	contents continued, or blank
7th leaf	(xiii)	list of illustrations
	(xiv)	illustrations continued, or blank
8th leaf	(xv)	introduction
	(xvi)	introduction continued, or blank
9th leaf	(xvii)	half title
	(xviii)	blank
10th leaf	(xix)	main text matter.

(a) appendix
(b) notes
(c) glossary
(d) bibliography
(e) index

Only an unusual book will contain all the different parts enumerated on these pages, but all books and pamphlets require one or more of them. Nor is the order here given followed invariably, although an examination of a considerable number of fine modern books will disclose this general plan of make-up.

The "front matter" of a book is usually set in type after the main text has been completed, and therefore it is customary to number the pages of this part separately, because one cannot know in advance how many pages of preliminary matter there will be. The numbering is done in small roman numerals, which are placed at the bottom of short or "sunken" pages, and at the top, in line with the running heads, on pages where matter is continued from a preceding page. Page numbers are now often omitted on short pages when the sequence is obvious. Conspicuous numbering is not in good form in the ordinary book.

Each separate feature of a well-made book should begin on an odd page; if it makes only one page, the back of the leaf is left blank. An exception to this rule is made in case of the main title page, which usually has on its back the copyright notice, and frequently the printer's imprint.

Copyright

Not any of the manuscript books were copyrighted, because no one regarded the idea that a particular way of telling a story or expressing

thoughts in writing was a piece of property having a commercial value. Even the early printed books bore no copyright notice. The idea of copyright did not come into existence until after the invention of printing had spread across the continent of Europe and to England.

When a book is published in modern times, the publisher has invested a certain amount of money in the production. The author also expects a reasonable reward for his labors, in the form of royalties. It is therefore equivalent to a theft of property if some other person reproduces parts of a book in the author's own words without full permission.

The Cover

The cover of a book may be stiff or flexible. Usually the stiff board will differentiate a book from a pamphlet, which commonly has paper covers, although it may contain as many pages as a book. A pamphlet of a few leaves of thin paper suggests a light, flexible cover, and rarely, except in case of some valuable or much-used edition, is it appropriately enclosed in stiff boards. Boards may be suitable if the page is larger than 12mo (duodecimo), about 5 by 7 inches. A pamphlet may have an *integral* cover, that is, of the same paper as the inside pages. It is then called *self-covered*. A book, bound in stiff boards, should be printed on paper that is also stiff enough, or of sufficient rag content, to keep its shape, and that will not readily double up when the leaves are turned over.

The *end-paper* is a folded sheet inserted, one at the front and one at the back. If the end-paper is of a special kind of stock, the *fly-leaf* may be an extra leaf (or two) of paper similar to that used for the body of the book.

The Bastard Title

The bastard title is the first page of a printed sheet, as books are commonly made, and although it has no number, it is understood to be page i of the preliminary matter. It is really a brief title, set in the upper half of an otherwise blank page, for ready reference, in a book of more or less elaborate arrangement of frontispiece, title, preface, etc. The bastard title page is rarely necessary in the ordinary pamphlet, and is usually superfluous in any work that has no other front pages than the usual title. The back of the bastard title is commonly blank or carries an advertising page relative to a series if the book is part of one.

A notice of limited edition is sometimes placed after the bastard title

on the back of the leaf; but the preferred position for this notice is on a blank page facing the last page of a book.

When the book belongs to a set or series, the number of the volume and the specific title of the book are placed on the bastard title in addition to the general title; sometimes the name of the author or editor is also added.

The Frontispiece

The frontispiece, if there is one, faces the main title page of the book, and in a sumptuous work it is protected by a tissue leaf. The frontispiece is regarded as the *chef-d'œuvre,* or master illustration of a book. It may be a portrait of one of the chief actors in the narrative, a picture of some salient point in the story, or what not. It should have an appropriate legend. Because the making of illustrations has been the finer, rarer branch of the graphic arts, the frontispiece has ever been accorded particular distinction in book-making.

When the frontispiece is an illustration which must be placed sideways on the page it is so bound in that the bottom or title line is next to the binding edge.

The use of a protecting tissue will often be dependent upon the character of the print. If it is a colored print, or one whose color will in time be likely to rub or set off on the opposite title page, the use of tissue is advisable.

The practice of using the back of the frontispiece for bits of verse or sentiment, with some decorative character, is noticeable in magazines, catalogs, and similar work.

The Title Page

A title page of some sort is necessary on any publication which consists of eight pages or more. Often a pamphlet of a few leaves with much reading may have its title on the cover, with a repetition in some form at the head of the first page; but for anything important enough to have a cover, it seems that a complete page might well be devoted to a brief statement about the subject. This statement should be given a little more fully than on the cover. For instance, the cover would contain the briefest general title, with perhaps the author's name; and the title page inside should give the title in full, with secondary or sub-title, the author's name (and, if needed, titles, official designation, etc.), the publisher's name, with name of place of publication, date, etc. The

old-time elaborate title page, crowded from top to bottom, is now only rarely in good style. In period typography, and in reprinting of ancient works, the elaborate title page is appropriate.

On the back of the title it is customary to place the notice of copyright, if the book is to be thus protected. This may be in small letters in short lines set somewhere above the center of the page. Below the copyright statement is the usual position of the printer's imprint—his name and address, trade-mark or device.

The Dedication

The formal dedication of books and pamphlets to an individual or a class of individuals was formerly a common practice. Its use has now become rarer, and it is properly confined to works having a peculiar personal flavor, either in the narrative or in the making of the book. When it is employed, it occupies the next leaf after the title. It may be a brief statement of four or five words, a bit of verse, or a longer paragraph, placed well above the middle of the page. The back of this leaf should be blank.

The Preface

This feature, with the title page and the table of contents, is the most familiar front matter of a book. A preface is usually a work of explanation either from the author, the editor, or the publisher, and it will often be advisable to put it in a style showing some distinction from the regular text pages. In the ordinary book, however, there need be little in its typographic style to distinguish it from the regular pages of the work. The same type-face and size, with the heading similar to that of the chapter heads, will be a safe style to follow. If the preface is brief, occupying a single page, the lines may be "leaded" wider; if it is desired to keep a lengthy preface in small space, the lines may be set "solid," or a smaller size type may be employed. Italic letter, of a style to harmonize with the rest of the book, may be used with good effect for a short preface. The selection of a type that is distinctly different from the other parts of the work is not good typography; nor should prominent *initial letters* or *head-pieces* be used if these features are not employed in the other divisions of the book. When head-pieces and initials are used at the beginning of chapters in the text, they may be used for the preface, but they may properly be omitted and the prefatory pages set in plain fashion, like the composition of the text pages.

Sometimes in addition to the preface there is a foreword by some other person than the author of the book; this foreword usually precedes the preface and is in the same style of typesetting.

Contents Table

In the common book this occupies a separate leaf, and if it is too long for the first page it will be continued on the back of the leaf, and even on the following leaf. The usual style indicates that this feature should not be crowded, but well opened between the lines, and rather widely spaced between words if the type-face will permit it. The style of type-face should be uniform with the other parts of the book, although capitals and small capitals of the same series are often used when there are few words. For a long table of contents in which the lines cannot be wide-leaded, the use of lower-case letters, with capitals where needed, will be more satisfactory than crowded lines of capitals. Italics may sometimes be employed in a work done in oldstyle fashion; but when in doubt, use roman.

The difference should be noted between the contents and the index. The table of contents is in the front of the book and states the chapters and subjects in the order in which they occur. The index should be at the back, and contains a list of topics, proper names, etc., arranged alphabetically.

Illustrations List

This section should harmonize with the contents table whenever it is possible to make it so, especially as to the style of type used, heading, and the arrangement of *leaders* which connect the title with the page number at the end of the line. The use of alternating dots on one page and of dots set in vertical lines on another should be avoided.

Like the contents, this list follows the order in which the illustrations come in the book, rather than an alphabetical order. When in doubt about the size of type, select the smaller (if it is a size or two smaller than the text of the book) and put extra leads between the lines.

The Introduction

The terms introduction and preface are often loosely used in the modern book. In many cases they are identical, and it is only when the work has both features that the distinction may be made. The preface is more commonly understood as a preliminary explanation that relates to the

publication itself and embodies the author's personal remarks to the reader; it has no organic relation with the text of the book. A brief introduction, foreword, or note by author, editor, or publisher, may be classed under the same head. The term introduction may be applied more specifically to matter bearing direct relation to the subject of the work, and is really the first chapter of the book, though it may not be so designated.

In its typographic treatment the introduction or foreword should be uniform with the preface, if that feature precedes it, and is separated from the text by a half-title leaf. The introduction follows the illustrations list, but when it is designated as Chapter I it naturally should be identical in style with the text pages.

The Half-Title

Formerly the half-title was the general title of the book, and it was placed at the top of the first chapter. Later, when greater liberality of paper was accorded to book work, this small title was taken from its position at the head of the first chapter and placed on a leaf by itself. It frequently consists of a repetition of the bastard title. In the well-made book the half-title seems a desirable division of the work, separating as it does the introductory matter, which has chiefly to do with the structure of the book, from the author's story. Other half-titles may be employed between other formal divisions of the work, as when the division is into parts, books, sections, etc., the half-title carrying the name of such divisional part.

Running-Heads and Folios

Running-heads are the lines printed in the space above the text matter, at the top of the pages, both left and right. For the wording of the running-heads there are two different plans in common use. In one plan, the title of the book is used as the left-hand running-head, the chapter title as the right-hand running-head. In the other plan, the chapter title is used on the left-hand page, and on the right-hand page appears the title of the chapter subdivision or of the article found on the page. The latter style is used in this book. The publisher or the author usually decides which plan is to be used. The folio or page number is usually set in line with the running-head; sometimes the folio is set in brackets. Brackets are frequently employed where some kind of key numbering is used, as section and article number, or volume number.

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FIGURE 1
A group of running-heads and folios.

Page numbers or folios are useful for reference and, when one consults the index, they aid in locating the desired topics or other parts of the text matter.

The position of the folio on the page is generally at the top, spaced away two to four points more than the depth of one line of type used in the text; that is, if the text is set in 12-point type, the folio would be 12 points plus 2 to 4 points away, or about 14 points from the first (or the last) line of text. The folio may also be appropriately placed at the bottom, in the center of the page. For pamphlets and catalogs the page numbers may be either on the inside of the verso and recto pages, or on the outside, at the top or at the bottom. Sometimes parentheses or brackets enclose the folios. Several styles are shown in the illustrations.

Arnold ther Hörnen of Cologne, Germany, is said to have been the first printer to print numbers on his book pages, about the year 1470.

Roman numerals, which are formed with the lower-case i v x l c d m, one size smaller than the type used for the text matter, are required for the pagination of the preliminary matter of a book; but for all the main text, usually beginning with page 1 or 3, Arabic numerals are used through to the end of the book.

When the folios are set in line with the running-heads, the odd folios belong on the right-hand side of the page, and the even ones on the left-hand side. The folios of a book are rarely placed on the inside of the pages.

The typography of the running-heads and folios depends upon the nature of the work. Numerous styles are sanctioned by good authorities. Capitals of the same size or one size smaller than the size of type used for the text, but of the same series, are often employed if the running-head consists of the title of the work and is not too long.

Miscellaneous Parts of a Book

In a volume containing a *memoir* or biographical sketch of the author, this matter may be placed after the contents table, and may be set in a type smaller than that of the text.

Maps in one or more colors may be interspersed at appropriate places throughout the text, or they may be grouped at the end of the work. If there are a number of maps, a list of these should appear in the front matter.

Chronologies and genealogies are similarly treated. Regarding these parts of a book no rules can be laid down; they will be disposed of by

author, editor, or publisher with the purpose of making the whole work orderly and easy of reference.

Perhaps a few words may be said as to the requirements of a pamphlet or book of a given size or character. Briefly summarized, it may be stated that any work of this nature should not be burdened with unnecessary features in addition to the main story.

A title page and a note of introduction, if necessary, would ordinarily be sufficient. A more elaborate pamphlet, with several subdivisions of text, may have in addition a table of contents. A bound volume of a periodical or magazine is greatly improved by the addition of a carefully arranged table, following the title page. A bound book of permanent value is worthy of a half-title and contents, in addition to the main title page, and it may properly have a dedicatory page and other "front matter" required for an orderly presentation of its subject matter. In a

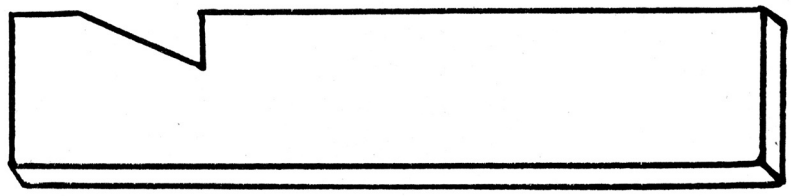


FIGURE 2

A convenient page-gage.

sumptuous volume, richly illustrated, with decorative head- and tail-pieces, initials, etc., the repetition of half-title leaves may be allowed before each important division of the work, as well as blank pages on the backs of the leaves, in order to begin new matter on the recto page.

Suggestions to the Student: In the forward part of this book, examine carefully the "front matter," i.e., all the pages which have roman numerals (including those which have no page numbers), and try to remember the sequence of the different features. Then examine a few other well-printed books, preferably those costing $5 or more, or one of the so-called "Fifty best books of the year" of the American Institute of Graphic Arts. You may then form your own comparison, and will recognize the similarity of treatment. In *Hand Composition* the pages are placed according to the established practice in book-making.

The Length of Pages

Among the more or less mechanical work of making up a book is the breaking up and the rearrangement of long galleys of composition into pages of the proper length. The approximate page-length is usually given in a dummy, which the stoneman should always have before him

before he begins making up. After the approximate length of the pages is known, the exact length of the type-page is determined by the length of a certain number of text lines, plus the running-head, folio, and the necessary leads or slugs required for spacing material. Therefore, the distance over all, that is, from the top line of the page to the bottom line of the page, is always a definite number of points, nonpareils, or picas, but not necessarily a certain number of inches and fractions of an inch.

All pages of a book should be exactly the same length, except the first page of a chapter, which should have a *sinkage* that may be from three to eight picas.

Instruction: A practical method of arriving at the point-length of the full page of a book is to make up the type for two facing pages and take proofs of them. Paste these proofs on a folded sheet having the same dimensions as the pages in the dummy of the book, and look at them critically; then decide if the spacing between running-heads and the page numbers is correct. If so, make a page-gage from a piece of reglet which is a few picas longer than the type-page. Always place a 6-point slug at the top and bottom of the page and count these slugs into the total length of the page. Lay the reglet alongside of the page and compress the type as much as possible; then cut a notch into the reglet at the point where the page ends. The page-gage should be used for all the pages of the work for which it was cut. In the illustration, Figure 2, the head of the gage is at the right, and measurement (or the length of a page) would be from the right end of the gage to the vertical line or cut of the notch.

Marginal or Side Notes

The first line of a new paragraph should not begin at the bottom of a page

In the first make-up, long and short pages are sometimes unavoidable because of *bad breaks* or *breakovers*. It is the custom in book-work never to end a paragraph in a single line at the top of a page. Good practice requires at least two or three lines. It is also bad taste to begin the first line of a new paragraph at the bottom of a page, especially if it is a *recto* page. If type matter happens to break that way, it is customary to place a guide-line at the bottom of the page which reads "line short, please fill," or "two lines short," or "line too long," or whatever the case may be. This calls the attention of the author to the deficiency, and he will usually write enough words or take out enough words to avoid a bad paragraph break.

Marginal notes, also called side notes, are always set in type two or three sizes smaller than the text matter. If the

words in the note lend themselves to a *squared* effect they may be set as shown in the illustration above; but if this seems impractical they should be so arranged that the type indention lines up or is *set flush* with the text matter. This will bring the uneven or "ragged" edge of the marginal note to the outside of the page, as shown here. It is set in a narrow measure, usually about 4 picas, and placed in the outer margin of the page, approximately opposite the sentence to which the note refers. Six or 12 points space, depending on the size of the page, is allowed between the note and text.

Six to twelve points space should be placed between the side note and the text

Cut-in Notes

Like all notes of reference, cut-in notes are set in type two or three sizes smaller than that of the text matter. As their name indicates, they are "cut into" the text lines; or, in other words, several full lines are "cut off" at one end, and the note is "set in" the blank space. Mechanically, this is done by placing a quotation quad (4 to 6 picas long, and of the required depth) in the composing stick. About 12 points white space is allowed all around the note. After the text lines have been composed, the quad is removed, the stick is "broken" to the width of the note, and the note composed. It is then adjusted alongside the text lines, as shown in the illustration in this paragraph.

In advertising matter this kind of note is usually bold-face type

Footnotes

If footnotes are to appear on pages, they should be placed in position at the bottom of the page, 6 to 12 points removed from the last text line. The distance that the footnotes are to be spaced away from the text matter may vary with the size and style of the type used; but on each page the spacing should be uniform.[1] Because notes are usually set one or several sizes smaller than the type of the text matter, they are set at one time and therefore kept together on galleys until the pages are being made up.

Marginal or side notes are now less frequently used in books than formerly, and this is also true of cut-in notes. The note that is in most

[1]The indention of the first line of the footnote should be the same as that of the paragraphs in the main text of the book. If the text matter is set in wide measure, footnotes are sometimes set in two columns. This method is, however, rarely used in the United States.

common use is the footnote. Where many notes of reference are required, these are appropriately placed in a separate section after the main body of the book. If such a plan is followed, the notes are numbered to correspond to the superior figures within the text, and are grouped under corresponding chapter headings. The type may be the same size as that of the main body of the book or a size smaller.

Placing Illustrations

The placing of illustrations so that they will look well on the pages of a book containing text matter frequently presents a problem for serious study. The two common methods shown in *Hand Composition* may safely be followed when any doubt exists. It is, of course, desirable to have all illustrations of approximately the same size or width, and a uniform style for placing these should be followed throughout the volume. If the illustrations are not too small, the best method is to place them in the center of the type-page from side to side, and somewhere above the center from top to bottom, if there be but one illustration for two companion pages. When this is not the case, some other arrangement may produce a more pleasing appearance. At least three lines of text matter should be run above the picture and four or five lines below it. If the illustrations are square or rectangular and very narrow—less than one-half the width of the type-page—they may be placed either to the right or to the left of the type matter, i.e., on a recto page they are placed to the right or outside, and on a verso page they are placed to the left or outside. Illustrations which are irregular in shape may be placed to the inside of the page. Lines of text matter are *run in* alongside the narrow illustrations until the depth of the illustration and the legend below it is reached. About 12 points white space should be left between the type and the picture.

The Legends

The legends below the illustrations should be set two or three sizes smaller than the type used for the main text of the book. The legends (sometimes erroneously called *cut lines*) should not be allowed to extend beyond the outer edges of the illustrations. See pages 49, 115, 197.

The Sizes of Books

The books described as 8vo, 12mo, or 16mo are understood by printers and publishers as the result of numerical foldings of paper formerly

called *medium* (18 by 23 inches) or its equivalent in square inches in a slightly different shape, that is, Royal (19 by 24 inches). The sheet 19 by 24 makes leaves of good proportion for the folio, quarto, and octavo foldings, but not for many of the smaller sizes. Folded for a 12mo, the sheet 19 by 24 inches makes the leaf 4½ by 7⅔ inches, a width too narrow for its height. Folded for a 16mo, it makes a leaf 4½ by 5¾ inches, which is too broad for its height. Folded for an 18mo, it makes the shapely leaf 3 5/6 by 6 inches; but the 18mo size is seldom used.

To make a 12mo of the acceptable shape of 5⅛ by 7⅔ inches, untrimmed, and to be printed in forms of twenty-four pages, one must provide paper of the size 23 by 41 inches, which is not a standard size. To print thirty-two pages of 12mo in two sections of sixteen, the sheet must be 30½ by 41 inches. To make the 16mo of good proportion on a

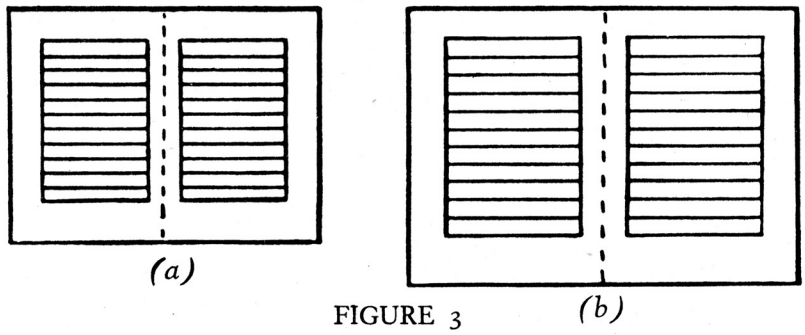


FIGURE 3

(a) Two pages having a 2 : 3 ratio; and *(b)* two pages of hypotenuse proportions.

sheet of thirty-two pages in sections of sixteen, the paper should be of the size 25 by 38 inches. The sheets are larger than *double medium,* but when folded for leaves of 24mo or 32mo the folded leaves are regarded and named as if they had been made from the usual shape of medium. Although a useful size of paper for ordinary pamphlets and for general job work, medium is seldom selected for library books.

Hypotenuse Sizes

Seven and one-half by ten and five-eighths inches is the page size adopted by the National Association of Purchasing Agents for booklets, catalogs, house organs, price lists and circulars.

Before the official adoption of this size by the National Association of Purchasing Agents, the United Typothetae of America investigated and recommended this size of 7½ by 10⅝ because it will fit best the equipment of the average printer.

A pocket booklet size, 5 5/16 by 7½, was also adopted by the National Association of Purchasing Agents. This size, saddle-stitched, will open and file flat with the 7½ by 10⅝ size.

Both sizes are hypotenuse oblongs. Among the many advantages of the "hypotenuse" proportion are these: The *hypotenuse oblong* enables one to reproduce books in smaller sizes or larger at a very slight expense, whereas otherwise the expense might be prohibitive. For instance: If the large book has the proper proportions and the size is, say, 7½ by 10⅝ inches, the smaller book would be 5 5/16 by 7½ inches, which is the larger size folded once. Both would cut from the same paper stock, 32 by 44, and since the proportion of length to width remains the same, the entire type composition and illustrations could be photographically reduced to 7/10 of the original size and etched without any additional art work or any change in the arrangement.

The covers for these two standard booklet and catalog sizes cut with little waste from 23 by 35-inch paper. The inside pages cut and fold without waste from 32 by 44-inch sheets.

Names and Proportions of Regular Book Folds

Names of Foldings	Size of Untrimmed Leaf, Inches	Number of Pages to Sheet	Size of Printed Sheet Inches
Folio	12 x 19	4	19 x 24
Royal Quarto (4to)	10 x 12½	8	20 x 25
Quarto (4to)	9½ x 12	16	25 x 38
Small Quarto (4to)	8½ x 13	8	*17 x 26
Imperial Octavo (8vo)	8¼ x 11½	16	†23 x 33
Octavo (8vo)	8 x 11	16	22 x 32
Super Royal Octavo (8vo)	7 x 11	16	†22 x 28
Royal Octavo (8vo)	7 x 9½	16	*19 x 28
Medium Octavo (8vo)	6¼ x 9½	32	25 x 38
Demy Octavo (8vo)	5¼ x 8½	16	*17 x 21
Cap Octavo (8vo)	4¼ x 7	16	14 x 17
Post Octavo (8vo)	5 x 7	16	21 x 29
Medium Duodecimo (12mo)	5¼ x 7⅜	24	*16 x 30
Duodecimo (12mo)	4¾ x 7⅝	24	*19 x 23
Sextodecimo (16mo)	4½ x 6	64	24 x 36
Medium Sextodecimo (16mo)	4½ x 6¾	32	†18 x 27
Medium Octodecimo (18mo)	4 x 6¼	36	19 x 24
Octodecimo (18mo)	4 x 6	36	18 x 24
Super Royal Tredicecesimo-secundo (32mo)	3¼ x 5	64	20 x 26
Tredicecesimo (30mo)	3¼ x 4⅝	64	19 x 26
Imperial Vincesimo-quarto (24mo)	3 x 5¾	48	18 x 24
Tricesimo-sexto (36mo)	3¼ x 4⅞	72	19 x 25
Quadragesimo-octavo (48mo)	2¾ x 3¼	96	*22 x 26

* Non-standard sizes. † English paper sizes.

The old names of various book and booklet page sizes, with their dimensions, are shown in the accompanying table. There may be, of course, slight variations from these sizes, depending upon the author's or publisher's requirements. All the names of the numerals or folds are in Latin, because this was the language which was used by Gutenberg and the first printers. Generally only the terms "folio, quarto, and octavo" are used; the other sizes are indicated by their abbreviations, as "12mo, 16mo, 20mo," etc. Because of the development of many different paper sheet sizes, some publishers now regard the Latin page designations as obsolete, and prefer to give the actual size of the trimmed page in inches.

Standard Sheet Sizes of Printing Papers

The standard mill sizes of book papers are: 24 by 36 inches, 25 by 38, 26 by 29, 28 by 42, 28 by 44, 30½ by 41, 32 by 44, 33 by 46, 35 by 45 inches, and the doubles of these sizes.

The standard sizes of bond papers are: 17 by 22 inches, 17 by 28, 19 by 24 inches, and the doubles of these sizes.

The standard sizes of cover papers are: 20 by 26 inches, 23 by 35 inches, and their doubles.

Standardized Page Sizes

The present century is one of standardization, and this accounts for the gradual disappearance of many of the old leaf- or page-sizes for pamphlets, catalogs, and booklets. Today the most practical untrimmed sizes of printed pieces are those which cut without waste from standard sheet sizes, among them being 2 by 3½ inches, 3 by 4, 3¼ by 6¼, 3¾ by 5⅛, 4½ by 6, 4 by 9⅛, 5¼ by 7⅝, 5½ by 8⅜, 6 by 9⅛, 7¾ by 10⅝, 8½ by 11, 9¼ by 12⅛ inches, and their doubles.

All these pieces cut from large sheets of the following sizes: 24 by 36 inches, 25 by 38, 26 by 29, 32 by 44, 35 by 45 inches, and their doubles.

Paper Computations

The student of printing should have some knowledge of the methods used in computing the weights and sizes of printing papers. Printing papers are designated according to the number of pounds which a ream of 500 sheets of a specified size weighs. The weight is called the *substance number*. Thus, substance 13 in bond papers means that 500 sheets of 17 by 22 inches in size weigh 13 pounds; substance 60 in book papers

indicates that 500 sheets 25 by 38 inches weigh 60 pounds. Consequently, a ream having larger or smaller sheets than 25 by 38 inches of the same thickness or substance number would weigh more or less than 60 pounds. These variations are known as *relative weights,* and can be computed mathematically either by a long or short method. Several methods are explained below:

One sheet of cover paper, 20 by 26 inches in dimension, taken from a ream weighing 65 pounds, contains 520 square inches and weighs 0.13 pound (65 ÷ 500). If a sheet of the same thickness measured 23 by 35 inches (805 square inches) its weight would be 0.201 pound (100½ ÷ 500). The weight of one sheet or any number of sheets of any size of paper may be computed by finding the total number of square inches in a sheet, or in a ream, of known weight and then dividing this quantity by the weight of the ream of basic size and multiplying it by the number of sheets desired.

Problem: How much will 60 sheets of cover stock, 20 by 26—65 weigh?

500 sheets 20 by 26 = 65 pounds
65 ÷ 500 = weight of one sheet, or 0.13 pound
0.13 × 60 = 7.80 pounds

Equivalent weights of paper, or the difference in weight between two sizes of the same basic weight, can be calculated if the student will learn a few simple rules.

As has been explained, a ream measuring 25 by 38 inches, of the weight or substance 40, would weigh less than 40 pounds if the sheets measured only 22 by 32 inches (the thickness of the sheets being the same in both sizes). Inversely, 500 sheets 32 by 44 inches would weigh more than the same number of sheets 25 by 38 inches. For quick reckoning the tables in this book may be used, but a student should not depend entirely upon tables for his printshop calculations. He should use his "thinking apparatus." The rule for determining the equivalent weight of paper is:

Multiply the known or basic weight by the surface area in square inches of the paper of the unknown weight, and divide by the superficial area in inches (basic size) of the paper of known weight. The result will be the weight of the paper desired. This is a simple proportional sum, and is illustrated in the following examples:

Problem: If a ream of paper, basis 25 by 38 inches, weighs 40 pounds, what will a ream of the same basic weight in size 26 by 29 inches weigh?

$$25 \times 38 : 26 \times 29 :: 40 : \text{unknown weight}$$

$$\frac{26 \times 29 \times 40}{25 \times 38} = 31.74 \text{ pounds}$$

To expedite the solving of the problem, cancel the figures.

As fractional parts of pounds are disregarded in the paper trade, 31.74 pounds are figured as 32 pounds, which is the nearest round number of pounds.

Many students find fractions in sizes of paper troublesome in figuring the equivalent weights. If the problem contains fractions, an easy way is to change the fractions to decimals, and put down the sums in the manner shown below.

Problem: If a ream of 32 by 44 inches weighs 74 pounds, what would the same paper, size 30½ by 41, weigh?

Size Weight

$$\frac{30.5 \times 41 \times 74}{32 \times 44} = 66 \text{ pounds, actually only 65.7 pounds.}$$

A ream of 30½ by 41 would weigh 66 pounds.

A rapid method of computing the weight of paper, and the value of it, is as follows:

Problem 1: 63 sheets × 2 = .126 (thousandths of ream)
Multiplied by 19.5 (weight of ream)
Multiplied by .29 (cents, price per pound)

```
   .126
 ×  19.5
 -------
   630
  1134
   126
 -------
  2.4570   (weight, in pounds)
   .29     (price)
 -------
 221130
 49140
 -------
$0.712530  (71 cents, value)
```

To find the weight of 63 sheets of paper weighing 19.5 pounds to the ream, multiply the number of sheets by two and point off three places. This reduces the proposition to decimals, that is, thousandths of a ream.

Multiply the product by 19.5 (the weight of the ream), which will give the weight of the required number of sheets in pounds. The weight thus found, when multiplied by the price per pound, shows the value of the sheets.

Proof: One ream of paper weighing 19.5 pounds at 29 cents a pound equals $5.655 (which is 19.5 multiplied by 29). $5.655 divided by 500 sheets equals $0.01131 per sheet. Multiplying this by 63 equals $0.712530.

Problem 2: Forty sheets of 28-pound stock, at 10 cents a pound. Solve by: $28 \times 2 \times 40 = 22{,}400$ or 22½ cents.

Again stated: Ninety sheets, 40-pound stock, 12½ cents. Solve by: $40 \times 12.5 \times 2 \times 90 = 900$ mills, or 90 cents.

The reason for using the decimals is that it is easier to compute with them than with odd numbers. The 500-sheet ream is doubled in order to get a decimal base of 1000. As an alternative one may strike off the last two digits in the result instead of multiplying by two, but then one must divide by 500; the answer will be the same.

The same result can be secured by dividing any of the basic figures by five (in order to get a decimal base of 100), and then striking off one figure to get the result in mills, or two figures to get the results in cents. Thus, using the last example:

$$40 \times 12\tfrac{1}{2} \times \left(\frac{90}{5}\right) = 9000, \text{ or } 900 \text{ mills, or } 90 \text{ cents}$$

This scheme is simply an extension of the use of the decimal system of figuring. Much of the calculating may be done mentally.

Comparative Weights of Papers in Bonds, Writings, Linens, and Ledgers

Basis: 17 x 22" Substance:	13	16	20	24	28	32	36	40	44
Size	Equivalent weights for 500 sheets								
16 x 21	11½	14½	18	21½	25	28½	32½	36	39½
21 x 32	23	29	36	43	50	57	65	72	79
22 x 34	26	32	40	48	56	64	72	80	88
17 x 28	16½	20½	25½	30½	35½	40½	46	51	56
28 x 34	33	41	51	61	71	81	92	102	112
18 x 23	14½	17½	22	26½	31	35½	40	44½	48½
19 x 24	16	19½	24½	29½	34	39	44	49	53½
24 x 38	32	39	49	59	68	78	88	98	107
19 x 26	17	21	26½	31½	37	42½	47½	53	58
20 x 28	19½	24	30	36	42	48	54	60	66
28 x 40	39	48	60	72	84	96	108	120	132
34 x 44	52	64	80	96	112	128	144	160	176

Standard Sizes and Weights of Book Papers

Basis: 25 x 38" Substance:	40	45	50	60	70	80	*90	100	*120
Size	Equivalent weights for 500 sheets								
22 x 32	29½	33½	37	44½	52	59½	66½	74	89
24 x 36	36	41	45	55	64	73	82	91	109
26 x 29	32	36	40	48	56	63	71	79	95
26 x 40	44	49	55	66	77	88	99	109	131
28 x 42	50	56	62	74	87	99	111	124	149
28 x 44	52	58	65	78	91	104	117	130	156
28 x 52	64	72	80	96	112	126	142	158	190
30½ x 41	53	59	66	79	92	105	118	132	158
32 x 44	59	67	74	89	104	119	133	148	178
33 x 46	64	72	80	96	112	128	144	160	192
34 x 44	63	71	79	94	110	126	142	157	189
35 x 45	66	75	83	99	116	133	149	166	199
36 x 48	72	82	90	110	128	146	164	182	218
38 x 50	80	90	100	120	140	160	180	200	240
41 x 61	106	118	132	158	184	210	236	264	316
42 x 56	100	112	124	148	174	198	222	248	298
44 x 56	104	116	130	156	182	208	234	260	312
44 x 64	118	134	148	178	208	238	266	296	356

* Applies only to coated papers.

CHAPTER XVIII

THE INVENTION AND THE MODERN MANUFACTURE OF PRINTING PAPERS

Primitive man first wrote on rocks. Records of this writing have been found in the caves of southern France, where the Crô-Magnon man roamed thousands of years ago. He used a crude sharp-pointed instrument to illustrate familiar objects or to convey information. Rocks were sufficient for such simple purposes before man had an alphabet, but gradually, with the development of the race, man needed a more convenient medium to express his thoughts. Had he been rightly aware of it, he must have seen, here and there, the original paper-maker, the wasp, at work busily building its nest of pulp; but there is no record that early man was wise enough to go to the wasp for information and borrow a useful hint. Instead, at a very ancient date, in widely separated quarters of the globe, he began to use various other materials—stone, clay, bark, papyrus, skins of animals, metal, wood, parchment, linen, and wax. But paper, once discovered, rapidly outstripped them all, and, since then, human progress and civilization have been bound up with the art and science of paper-making.

Paper was invented in the year 105 A.D. by the eunuch T'sai Lun. He is said to have used tree bark, hemp, rags, and fish nets, which he macerated in a mortar, to form a pulp.

In 1911, Sir Aurel Stein, the British explorer, found, in the ruins of a spur of the Great Chinese Wall, a fragment of paper, to which a date of 150 A.D. has been fixed. This is the earliest paper that has so far been recovered. Upon analysis by Dr. Weisner, of Vienna, it was found to consist largely of bark of the paper-mulberry, with some rag fibers.

In 705 A.D., the governor of Samarkand, Zijad ibn Salih, defeated a Chinese army, taking captive some paper-makers, who introduced their art into Samarkand, which rapidly developed a great paper trade. In the year 793-94, Ja'far, the grand vizir of Haroun al Raschid (of Arabian Nights fame), introduced the use of paper into the chancellory of the Khalifate of Bagdad, by bringing Chinese workmen to start the first

paper factory in this city. The manufacture spread to Arabia, Syria, and Tripoli, and soon became common in Egypt, where a traveler (Nassiri Khosran, 1035-42) was astonished to see the Cairene grocers wrap their wares in paper before delivering them to their customers. Jean Montgolfier, a captive of the Turks during the Second Crusade, about 1150 A.D., learned from them the art of making paper from cotton. After his escape, he introduced paper-making into France. The method of paper-making taught by the Arabs to the Spaniards and Italians in the thirteenth century was almost exactly the same as that which the Arabs had learned from the Chinese in the eighth century.

The manufacture of paper is one of the oldest industries that has had a continuous existence coincident with recorded history, and the process today is practically a revision of the method used by the Chinese. When speaking of paper in this sense, we must include the *papyrus* of the Egyptians (described in a previous chapter), which was a product closely resembling the early Asiatic paper, and was used for many of the purposes for which we use paper today.

Before the use of papyrus, inscriptions were cut on stone, ivory, bark, and almost any substance that had a flat surface. In Babylonia an immense commerce was carried on with the civilized world, in which all transactions were recorded by indenting characters with a stylus in clay tablets. The clay slabs were afterward baked to harden them. In the ruins of some of these once wonderful business cities have been found thousands of these clay tablets, recording just the sort of data that would be found in filing cabinets of a business office today.

The First Wood-Pulp Paper

It was René Antoine de Réaumur, at first a very retired student in France, who devoted himself to pure scientific researches. But in the paper-making industry we now speak of Réaumur (1683-1757), natural philosopher and inventor of the thermometer which bears his name, who devoted himself to the study of wasps, and found out how, by mastication of bits of wood, they make the papery substance of which their nests are composed. The manufacture of wood-pulp is founded upon Réaumur's discovery. The common wasp, which makes large, ball-like nests in trees, was therefore the first paper-maker; and after centuries of experimenting with many different materials, we have come back to exactly the material the wasp uses, and we use it for nearly all the paper that is made—that is, wood pulp.

There are innumerable kinds of paper made today for various purposes, and although the materials used in their manufacture may be of different substances, they all are made by practically the same process.

Modern Manufacture of Paper

The production of paper really begins in a forest. In the northern forests of the United States and Canada, trees of suitable size are felled by the woodsmen during the winter months. In the spring the logs of *spruce, poplar, chestnut, gumwood, hemlock,* etc., are floated down the rivers to the sawmills, and there they are cut into 4-foot lengths, to be later shipped to the paper-pulp mills. The short logs are stored until thoroughly dried and seasoned.

The De-barkation Process

The bark of logs is removed by placing the chunks in a machine which shaves and scrapes them. Then the logs are thoroughly washed in another machine which jostles them about and sprays hot water or steam against them with powerful force. They now pass on a conveyor to the chipping machine. This machine consists of a very heavy steel disk about 8 feet in diameter, set with radial knives and provided with a trough for the purpose of holding the log in such position that the chips are cut off by the rapidly revolving knives with a slicing motion. All chips are then screened in metal hoppers which shake out the sawdust and the chips which are too large; the latter are returned to the chipper. From the screen the chips are carried by a conveyor to large storage bins—cylindrical tanks, about 80 feet high and 30 feet in diameter.

Ground-Wood Paper

The most common of the wood-pulp papers is *newsprint.* For this kind of paper, spruce wood logs, from which the bark has been removed, are ground to a fine pulp by simply pressing them against a coarse grindstone. This is called *mechanical wood pulp,* and because the entire mass of wood is used, including the pitch, lignin, and other impurities, newsprint paper has a short life. Ground wood stock looks something like a coarse powder. While it is still wet it is run into laps, or in some mills it is thrown directly into the *beater,* where it is combined with a percentage of *sulphite pulp,* which is a stronger cooked wood pulp, some *sizing,* and a little coloring matter. This mass is then run onto the paper-making

machine. Mechanical pulp deteriorates very quickly, and for that reason it is used mostly for the cheaper grades of paper, as news, rotogravure, wrappings, and some tag papers.

After newsprint, the next better grade of paper usually contains a preponderance of *soda pulp,* and from that up in the scale of quality come *bleached sulphite pulp, rag pulp* made of cotton rags, linen rags, each and all of them subject to mixing with one another. In the making of the better grades of paper, except bonds and ledgers, various clays are used as *fillers* to obtain the required surface. The paper used for making United States money consists almost entirely of linen rag pulp.

Digesting the Chips

We come back now to the small pieces of wood, obtained from the logs after they have passed through the chipping machine, and follow them through the various processes. From the large storage bins the chips, which are about ⅜-inch thick and 1½ to 2 inches long, are fed into immense steel receptacles, 50 to 60 feet high and 15 feet in diameter, called "digesters." A quantity of "liquor," mainly *calcium bisulphite,* is poured into these tanks, and live steam is then forced in from the bottom for a period of about twelve hours. At the end of that time the lignin, pitch, and everything that is found in wood, except the actual fibers, have been dissolved into a liquid. The pure *cellulose,* which constitutes about 50 per cent of the mass of the wood, remains uninjured. This is drawn off and subjected to repeated washings and screenings in order to remove the last vestige of the "liquor." The resulting mass is a yellowish, gummy-looking substance, which must now be treated for several hours with a bleaching compound in order to change it to a pure white color. The manufacture of *sulphite pulp* is completed by a machine which removes the water and turns out the pulp in thick sheets, resembling heavy blankets. These may be used at once, or stored until needed.

Wood pulp in dry form, in sheets or rolls, is also imported from Europe and Canada. When the wood pulp is to be used at once, it may be conveyed directly to the *beaters.*

The Beaters and the Refining Engine

The stock to be used is measured and conveyed into a long tub called a beater. The *furnish,* so-called, of a run of paper is made somewhat

as a bakery produces a batch of dough. A certain number of thousands of pounds of soda pulp and a certain number of pounds of sulphite pulp are mixed in the beater, together with the necessary amount of clay, sizing, and coloring matter. Even the dry pulp "blankets" may be fed into the beater and mixed with the wet pulp. The *sizing* is the resin mixture which gives a hard, smooth surface to the paper and prevents ink from running and blurring, or penetrating too quickly when the paper is finally used for printing. The whole pulp-mixture is circulated around the beater and flows down onto a large roll with a series of knives set longitudinally and a bed-plate with a series of knives running in the same direction as the knives on the roll. The fibers, as they pass between the two sets of knives, are brushed out, thus separating the various tendrils, so that they will knit together properly, and absorb a sufficient quantity of water. After the stock is thoroughly beaten, it is dumped into a *digester,* and from there it goes to a machine called a "Jordan," which further refines and purifies it. The Jordan is a contrivance consisting of a metal shell shaped like a cornucopia. To the inside of the shell is fastened a filling composed of knives, running the length of the shell. These knives are separated by wooden blocks. A cone, the same shape as the shell, fits inside of it, and on this cone is another series of knives and wooden blocks. The fibers are run down over the knives in the cone and are there cut into proper length. They now pass into another digester and are then pumped up to the screens. As they pass through the screens the dirt and any large fibers that have not been removed during previous processes are screened out of the mixture. The fibrous pulp is now ready for the paper-making machine.

Different Kinds of Pulp

In the manufacture of paper, wood pulp is now used more than any other material. The different kinds of fibers used for making paper are *bleached* and *unbleached sulphite; bleached* and *unbleached sulphate; bleached* and *unbleached soda fiber,* and *ground wood.*

There are several grades of cotton rags which make various grades of rag pulp and are used principally in high-grade book papers, writing papers, and index cards. Linen rag pulp is used in making paper for many of the various bond and ledger papers; and it is also used in certain grades of cover stock and specialties.

Bleached and unbleached sulphite and bleached and unbleached soda

fibers are used in the manufacture of book papers, cover papers, and specialties in varying degrees; bleached and unbleached sulphite are used to a small extent in some book papers, and to a great extent in writing papers. Bleaching of the pulp is accomplished by means of chemical solutions.

The preparation of any raw material for use in paper-making consists essentially in isolating the *cellulose* in the form of *fibers* from the intercellular matter with which it is surrounded. The efficiency of the *soda process* depends upon the solvent and saponifying power of alkali under high temperature. Theoretically any wood (or plant for that matter) might furnish the paper-maker with material. Generally, however, only two or three kinds of wood are used: *poplar, gum,* and *chestnut.* These woods are used for the production of the short, fine fibers through the soda process, and as they have practically no strength they are used as *fillers.*

Sulphite fiber is made from *spruce* and *hemlock,* which are longer-fibered woods than poplar and chestnut, and the wood is disintegrated into fibers by the *sulphite process.* Sulphite pulp comes in a number of grades, *strong unbleached, easy-bleaching,* and *bleached sulphite.* There are various qualities of each of these grades.

Sulphate fiber of various kinds is made of *spruce,, hemlock, fir,* and *pine.* The mechanics of the manufacture of sulphate pulp is practically the same as that used in making soda fiber, except that the wood is cooked with sodium sulphite or caustic soda.

Making Rag Pulp

In the manufacture of rag pulp the various grades of rags are treated in practically the same manner as other fiber-producing materials. Rags are collected from homes and factories and are cut up into small pieces by a machine, and dusted and cleaned in another machine. They are then put into a rotary boiler or "cooker," which is a long metal cylinder, placed horizontally in bearings, allowing it to be turned. A solution composed of *caustic soda* or *caustic lime*—sometimes a mixture of both —is run into the rotary cylinder and its covers are securely fastened. The *rotary* is then "run" for a given number of hours, depending entirely upon the class of rags to be treated. The constant turning of the rotary and the action of the chemicals loosens the dirt and dust still remaining in the rags. After the mixture has been thoroughly churned, the covers

are taken off and the rags allowed to drop to the floor of the rotary-room. Generally they are allowed to stand there for a certain length of time and are then taken to the "rag washer," which is constructed similar to a *beating engine*. This is a tub with a beater part-way through the center, causing the rags to circulate around the tub continuously in the same direction. Water is run into the tub and is extracted by means of a suction-box through which the water is run off. After the rags are thoroughly washed of all dirt and impurities, the remaining pulp is bleached out by the addition of a bleaching-powder solution. Then the rags are washed again and are dropped into a draining room, the ceiling and walls of which are composed of porous tiles. This permits the water to drain down through the rag fibers and through the porous tiles to an outlet below. After lying in the "drainer" the proper length of time, the rag pulp is ready for use.

Fillers Used in Papers

Clay is used in uncoated papers as a filler. There are various other substances that are used as fillers, among them *asbestine, chalk,* and *talc*. Clay used in paper-making comes mostly from England, but it is produced to a limited extent in this country. There are various kinds, graded according to their fineness (when powdered), color, and freedom from non-dissolving or gritty substances. Clay serves to fill in the interstices between fibers and to give a smooth surface to the paper. Paper made without a filler is inclined to have a slightly uneven surface, full of "hills" and hollows, which would cause a poor printing surface for halftones and other engravings.

The Fourdrinier Machine

The machine now almost universally used in America and Europe for paper-making is the *Fourdrinier*. In 1799 Louis Robert of France, aided by Leger St. Didot, invented a machine for making paper in a continuous web. (Before that time paper had been made in single sheets in a hand-mold.) After the expenditure of much time and money in correcting the imperfections of this machine, the brothers H. and S. Fourdrinier of London made it practical in 1805.

After the pulp reaches the paper-making machine, the manufacture of newsprint, writing, and practically all other papers, is carried on in much the same manner. The pulp, whether it has been made by the

sulphite process, or directly from ground wood, as in newsprint, is diluted with water until it forms only a small percentage of the mass. The sieve of the ancient paper-maker has become a long, fine-mesh (60- to 80-gage) wire screen, 8 to 20 feet wide, on the paper-making machine. This screen, which carries the stock over a series of suction-boxes, revolves continuously as an endless belt. At one end it receives the watery mass, which it passes on as a continuous film of pulp, under the *dandy-roll* and to the first press-roll. At the suction-boxes a vacuum is created which allows the atmospheric pressure to press the water out of the fibers so that by the time the pulp reaches the first press-roll a great deal of the moisture has been eliminated, and the pulp of fibers has become a very damp web of paper. The web of paper then travels over a series of thick woolen felts and passes on to the "dryers," which consist of a series of steam-heated cylinders resembling the mangles in a laundry. A large canvas belt or "dryer felt" conveys the paper web over the dryers and these evaporate all the remaining moisture in the paper.

At the other end of the Fourdrinier machine is a series of machine *calenders,* which are polished steel rolls placed one above the other in stacks.

Finishing the Paper

The web of paper is passed through a stack of smooth, chilled iron rolls, which by their own weight, and pressure supplemented by screws or weights, smooth the paper and produce what is called a "machine finish," as contrasted with a "super-calendered" paper. The calenders determine the finishes of the various kinds of "M. F." paper. To produce a high finish, the paper is run through the entire stack, but in running a rougher finish, such as *antique,* a certain number of iron rolls are by-passed. The web is now wound on a reel. Many grades of paper require a higher and smoother surface-finish, for finer printing and color work. This finish is given by the *super-calenders*—a stack or tier of heavy rolls, made alternately of iron and compressed paper, which are driven by power applied only to the bottom roll of the stack.

Coating the Paper

Where a brilliant finish is required, such as is demanded for catalogs and other printed matter carrying fine *halftones,* a coating is placed over the machine-finished surface of the paper. The coating is a mixture of one or more mineral compounds, either natural or artificial, in liquid

form, combined with an adhesive or binder to sufficiently attach it to the paper. It consists principally of *satin white,* imported English *china clay,* and *blanc fixe,* with *casein* (a product of skimmed milk) as an adhesive. The coating machine consists of a drum over which the web of paper passes to an inclined endless rubber apron that also acts as a bed against which the brushes may bear in order to spread the coating evenly, so that each portion of the web will receive a film of uniform thickness. The coated web is then passed to the drying gallery, where it is automatically looped upon sticks and is carried the length of the room, in which the air is kept heated to a high temperature. This causes rapid drying. The process described applies to the machine which coats but one side of the paper at a time.

In some paper mills there is also in use a machine, of recent development, called a *double-coater,* which coats both sides of the web at the same time. This contrivance consists essentially of a large cylinder from which the paper receives the main coating-liquid, and is then passed to a smaller roll, at which the coloring matter is added. The web is now passed between two squeeze-rolls that spread the coating evenly and remove the surplus liquid, after which it is carried along for about a hundred feet over a series of hot-air valves or blowers. These keep the web suspended until the coating is practically dry, when it is looped into festoons and conveyed to the drying-room.

Inspecting the Paper

Like all other papers, the coated web is finally cut into sheets of standard size. The piles of sheets are then inspected, a sheet at a time, to detect minute flaws, little wrinkles, specks of dust in the coating, and other defects which are not permitted in first-class paper. Defective sheets are removed and they go back to the beating machine to be made over into an inferior grade of paper. Finally, when a lot of paper has passed several inspections, and laboratory tests, it is counted into reams of 500 sheets, trimmed to accurate size, and packed into cases or on skids. It is then ready for shipment.

Book, Writing, and Cover Papers

Although the principal substance in book papers, and in some writing papers, is *sulphite* pulp, they are made of varying combinations of

sulphite and soda fibers, or rag fibers, sulphite, and soda fibers; in fact, in almost any combination that a paper-dealer or publisher may require.

Book papers may be had in various finishes, such as *antique, machine finish, plate finish,* and *supercalendered finish.* The range of prices per pound is based upon the quality of the material used in the manufacture of the paper. Book papers are made in various shades of white, but most of them have a blue-white cast. School books, or books that are to be read by artificial light, are invariably printed on a natural shade of paper, because such a shade is easier on the eyes than a tint.

Writing papers, or bond papers, so called, are of three classes: those made of 100 per cent bleached sulphite fiber; those of 100 per cent rag fiber; and those made of a percentage of sulphite and of rag fibers.

Permanent paper—paper that measures its life in terms of centuries—is made from rags: new white cotton cuttings, without the addition of chemicals of any kind, or, to be more exact, from 100 per cent cotton fiber. This fiber could be used direct from the cotton plant, but it is less expensive to take it from pieces of textile that would otherwise be wasted. The "rag content" of a paper, therefore, simply indicates the percentage of pure, sterilized cotton fiber that goes into its manufacture. Claims have been made that certain special grades of sulphite are permanent, but as they have not been in use for any great period of time, it is impossible to say that they are permanent. In the old days, all paper was made from rags, and we know that the old books, printed many years ago, are as nearly permanent as any printing or writing that we have today.

In cover papers the principal consideration is strength. They are made in various colors, and generally text or book papers are made in the same lines to match.

Suggestion to the Student: You may obtain a fair knowledge of how paper is made by reading about it, but you can acquire a more comprehensive understanding of the processes and machinery used in the paper industry by visiting a pulp and a paper mill. There you may observe the production of pulp and paper, from beginning to end.

It is said that the true test of a sheet of paper is on the printing press, and some paper mills which make printing papers have their own testing departments, in which every mill-run of paper is given a thorough printing test. There are, however, several interesting tests which may be conducted without a press. Let us try a few of them.

Instruction: Take a sheet of coated paper, and fold it, first in one direction and then in the other; observe which fold is the smoothest, and thus discover the direction of the grain in the paper. Paper containing long fibers always folds easier with the grain than against it.

If you are in doubt whether or not a sheet of paper has a coating, dampen your finger with saliva and press it firmly against the paper; if the paper has a coating your finger will stick to the sheet. If the paper merely contains a sizing, the sticking will be barely perceptible. Look at the paper to see if some of the coating has been removed where your finger was pressed upon it.

The *grain* of paper is the general direction in which the fibers lie, within the sheet, and is determined by the flow of the *stuff* on the paper-making machine; the fibers are longer in the direction of the flow than against it. You may discover the grain direction by this method:

Cut two pieces of paper, 1½ by 4 inches, from a sheet, one piece from the long side and the other from the short side of the sheet. Put the two pieces together so that they will exactly cover each other; hold on to them at one end so that they would stand out horizontally if they were perfectly stiff. The under piece will fall away from the top piece at the free end if it has the grain running crosswise, but if the grain runs the long way the under piece will not fall away from the upper. Change the position of the pieces and try the experiment again. You will notice that the paper is stiffer in the direction of the grain than across it.

Color Test: Place several small strips of colored paper in the sun and cover them with a galley or some other opaque substance, so that only about an inch of paper strips will protrude. After several hours' exposure, observe how much the ends of the paper have changed or faded. You can thus determine the degree of color-permanency by the actinic action of the sun's rays upon the pigments in the paper.

Some of the dyes used in the manufacture of paper are light-proof; others are slightly fugitive, and still others are very fugitive. Ink manufacturers use an instrument called an *actinometer* for testing the permanency of the pigments used in printing inks, and paper manufacturers also use a similar contrivance for testing the permanency of the dyes used in papers.

Test for Opacity: In order to compare two or more sheets of paper for their opacity, place a printed sheet against a window-pane and cover it with pieces of the paper to be tested. You will observe that the more opaque a paper is, the fewer pieces will be required to obscure the printing on the sheet underneath them. In other words, the more translucent a sheet is, the more pieces or thicknesses of paper will be required to entirely obscure the printing on the sheet below.

There are a number of laboratory tests, some of which require scientifically constructed instruments. Among the instruments for testing the physical characteristics of paper are the *Schopper folding machine,* which registers the number of times a sheet of paper may be folded back and forth before breaking. This is the so-called *folding test.*

The *Mullen tester* gives the pressure required to rupture or break a sheet of paper. This is the *bursting test,* compressed air being used to burst the sheet.

The *tensile tester* is an instrument which shows, on a gage or dial, the actual tension to which a given strip of paper may be subjected before breaking. The same instrument is also used for indicating the percentage of *stretch,* either with or against the grain, in a sheet of paper.

GLOSSARY

A GLOSSARY AND DICTIONARY OF TECHNICAL TERMS USED IN THE GRAPHIC ARTS INDUSTRIES

A

ACCENTS—Small marks, over, under, or through letters, to indicate difference in pronunciation, etc. They are usually cast on the letters, as è, é, ē, ê, â, ä, ö, ü, ñ, but they are also made in separate pieces, called *piece accents.*

AD—Short word for advertisement; plural *ads.*

AD-MAN—A compositor who sets advertisements, as on a newspaper or other publication.

AGATE—A small size of type, between *pearl* and *nonpareil,* 5½ points under the point system.

ALDUS MANUTIUS—A famous Italian printer (about 1450-1515). *Aldine editions* are books published by him and his successors up to 1597. Aldus, in 1501, first used a semi-cursive type, which is now called *italic.*

ALIGNMENT—The exact correspondence, at the bottom or top, of the letters or characters of a font of type. Different sizes of type may be so justified that their faces are uniform either at the top or at the bottom, and they are then said to *line,* or *line up.*

ALLEY—In a composing room, the floor space between stands or cabinets at which compositors work.

AMPERSAND—The name for the character &. It is the corrupted form of *& per se and;* also called commercial or *short and.*

ANTIQUE FINISH—Said of paper that has a rough surface.

APPENDIX—An addition to, or a supplement of, a book, printed and bound as a part of the volume. It usually follows the last chapter and precedes the index.

AQUARELLE—A colored picture, produced by printing from a key-plate the subject or reproduction in ink, and then applying water color with brushes through stencils which are placed over the print, different stencils for different colors being necessary.

AQUATINT—A print obtained through a method of etching on copper or steel to produce an imitation of a drawing in sepia, water color, or india ink, giving the effect of tone without line. The process was invented in France, about 1780, and consists of placing a copper plate in a dusting-box containing finely-ground rosin, which deposits evenly upon the surface of the plate. The plate is then heated to "set" the rosin, after which it is placed in an acid bath and etched.

AQUATONE PROCESS—A modern process founded on the principle which is employed in the process called *Lichtdruck* in Germany, *collotype* in England, and *photogelatin* in this country.

ARABIC NUMERALS—The ten figures in common use, so called because they are supposed to have come from Arabia: 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

ART PRESERVATIVE OF ALL ARTS—A poetic phrase often used by writers and speakers to designate the art of printing. It implies that through printing the knowledge of all other arts and sciences is preserved and increased.

ASCENDER—That part of a lower-case letter which extends into the upper shoulder of the type. The letters b, d, f, h, k, and t are *ascending* letters.

AUTHOR'S ALTERATIONS—Changes made by the author after the proofs have been read and corrected according to the original copy. Abbreviated A. A.'s. The same as *author's corrections,* or A. C.'s.

AUTHOR'S PROOF—A clean proof sent to the author after the compositor's errors have been corrected.

B

BACKING, or BACKING UP—*(a)* Printing the second side of a sheet. *(b)* In electrotyping, filling in the back of the thin copper shell with metal in order to give it stability.

BALANCED—When lines of type or parts of a job of composition, exerting different optical attractions, either in one direction or another, are given the same feeling of rest as is found in a design that is exactly equal in harmony, shape, symmetry, and proportion, the job is said to be well balanced.

BANK—A high table with inclined top, upon which composed type is temporarily placed. See *Dump.* Often applied to any bench with a sloping top, if used for type-matter. The worker in charge is called a *bankman.*

BASTARD—*(a)* Said of type-faces larger or smaller than commonly made on the body, as a 7-point face on an 8-point body, giving the effect of being leaded; or a 9-point face on an 8-point body, giving the effect of compactness. *(b)* Before the universal adoption of the point system, type-bodies not of standard size.

BASTARD TITLE—A small title of a book, without the name of the author or publisher. This abbreviated title page usually precedes the full title; sometimes used instead of the term half-title.

BEARD—The sloping part between the face and the shoulder of a type character. See Chapter VIII.

BEARERS—*(a)* Strips of metal or wood, type-high, placed at the ends of job press chases, to bear off the impression on light parts of a form, and carry the rollers evenly over it. Cylinder presses have bearers on the sides of the bed under each end of the cylinder to preserve uniform motion and impression of these two parts. *(b)* The metal guard-lines placed around and in blank parts of a form to be molded for an electrotype, to bear off excessive pressure.

BED—The flat part of a press upon which the type form is placed. The opposite part, on which the sheet is laid, is the platen, or the cylinder.

BEN DAY PROCESS—A method, in photo-engraving, of laying tint-patterns on metal by use of a special shading apparatus which employs a transparent film that has the desired pattern drawn on it. The film is inked, turned face down, on the picture, negative, or metal plate, and with pressure is transferred to any part where the shading is required.

BEVELED STICKS—Side-sticks of wood or metal, thicker at one end than at the other, beside which wooden wedges or quoins are placed, to hold type securely within a galley.

BILLHEAD—A printed form, ruled or unruled, on which an invoice or bill of goods is presented to a buyer.

BIND—In composition, when a line, lead, or piece of furniture is a little out of place, or too large, and does not allow the other matter to lock up, it is said to *bind*.

BINDER—*(a)* One who binds books, pamphlets, and the like. *(b)* A temporary cover for periodicals, pamphlets, etc., usually made of stiff material, and often with metal rings, so that it may be removed.

BLACKLETTER—A term which denotes the style of type in use during the early days of printing, and, in modified form, since then; so called because of its black appearance when printed. Also called text letter. **This is 10-point Cloister Black.**

BLEED—When a halftone or tint block is printed on a sheet so that it extends to the edge, and afterward part of the edge is trimmed off, it is called a *bleed*.

BLIND-TOOLING—Impressions made with the tools of a finisher or with a book-die on leather, without application of ink or gold leaf; sometimes called *antique*. *Blind embossing,* embossing without color.

BLOCKS—The wood or metal bases on which electrotypes, engravings, or other printing plates are mounted to make them type-high.

BODONI TYPE—A popular modern roman style of letter, designed and cut first by Giambattista Bodoni (1740-1813) of Parma, Italy, in 1771, and named for its originator. **This is 8-point Bodoni Book.**

BODY—The size of type considered up and down its face; the width of a type is called its *set*.

BOLD-FACE—A general name given to any type which has a heavy, black face; also called full-face.

BOLT—The uncut edges of a folded sheet, or of a signature of a book.

BONE FOLDER—A small stick of bone, about six to eight inches long, rounded on both ends and on its sides, used for folding sheets by hand. Folders are also made of ivory, steel, or wood.

BOOKLET—A small book, or a pamphlet.

BOOKMAN OLDSTYLE—The name of an oldstyle roman type. **This is 8-point Bookman.**

BORDERS—Plain and ornamental units of type, the pieces being adjustable in lines to surround pages, form panels, etc.; also strips of plain or ornamental rules.

BOURGEOIS (pronounced *bur-jois'*)—The old name for the size of type now known as 9-point.

BOX-HEAD—In tabular matter, the enclosed heading over a column of figures. In composition generally, the term is also applied to words surrounded by borders or rules.

BRACES—Type characters like these , used in grouping or combining two or more separate items.

BRACKET—One of the marks of punctuation, usually in pairs, [ ], to enclose words, phrases, figures, etc.

BRASS RULES—Strips of brass, type-high, of various thicknesses, and of many styles of face. Used in job composition for forming straight lines, borders, wavy lines, etc.

BRAYER—A small hand-roller used for distributing or spreading ink on type, etc.

BREAK-LINE—The last line of a paragraph, where quads are required to fill out the space.

BREVIER—A size of type between minion and bourgeois, corresponding to 8-point under the point system.

BRILLIANT—A very small, infrequently used size of type, equal to 3½ points in the point system.

BRISTOL BOARD—A class of fine cardboard, in various thicknesses and finishes.

BROADSIDE—A large sheet, printed on one or both sides, and folded in a special way; sometimes unfolded, like a poster.

BROCHURE (pronounced *bro-shur'*)—A pamphlet containing a brief treatise of transitory interest, stitched into a few leaves.

BUCKRAM—A kind of thick, strong cloth, finished like linen, in various colors, used for bookbindings.

BULK—The thickness of a pamphlet or book without its cover. A given number of leaves of thick paper will *bulk* more than the same number of thin leaves, although they may be of equal weight.

BURIN—*(a)* An engraver's steel tool; a graver. *(b)* The style or manner of the engraver's artistry, as a soft burin, or a brilliant burin, etc.

BUTTED—Said of rules or slugs when they are placed end to end, in order to make a wider line or measure. Two 12½-pica Linotype lines are "butted" in order to make a line 25 picas wide.

C

CABINET—A frame for holding type cases, etc.

CALENDAR—A sheet showing the arrangement of days, weeks, and months of the year.

CALENDER—In paper-making, a machine with rollers between which paper is passed to give it a smooth, glossy finish. Super-calenders have alternate sets of chilled-iron and hard-paper rollers of different diameters, and are used for polishing the surface of sized and coated papers.

CANCELED FIGURES—Figures with diagonal strokes running through them, 2, 4, 5, used in mathematical books, etc.

CAPS—Short term for capital letters.

CAPTION—A heading, or headline, at the top of a chapter or an article, etc.

CASE—*(a)* A shallow wooden tray, divided into compartments or boxes, in which the different characters of a font of type are kept. *(b)* The cover of a book, before it is placed on the book. *(c)* In electrotyping, the foundation on which the molding compound is flowed for the purpose of making a mold.

CAST—An exact duplicate of a type form, engraving, or other relief surface, by means of electrotyping or stereotyping. See *Electrotype.*

CASTING OFF—Estimating the number of pages or columns of type a given amount of copy will make.

CASTING UP—Measuring the amount, by ems, of type set, to find the cost of composition; also applied to planning tabular composition in laying out the job.

CATCH LINE—In display, short, unimportant words (the, of, at, etc.), between large lines.

CAUDEX or CODEX—Before the invention of modern paper, writing was done on various substances, including wooden boards or tablets, and these tablets were called *codices*. The ancients wrote by making notches in the tablets; afterward the early Romans covered them with wax and used a stylus to write on the wax. The word codex thus came to mean writing, a book, a collection of laws, and finally was modernized into *code*.

CEDILLA—A French accent under the letter c (ç), giving it the sound of s.

CHALCOGRAPHY—The art of engraving or cutting on metal, usually brass or copper, for printing purposes, as punches, types, etc.

CHAMFERED RULE—Old-time term for mitered or beveled rule.

CHAPTER HEADS—The headlines at the beginning of a chapter, usually *sunk* from the top line of the full page.

CHASE—The iron frame in which type is locked up for the press, made in many styles for various uses.

CHIAROSCURO—*(a)* A method of engraving and printing from wood or metal, first practiced during the Renaissance in Europe. The process employs a key-engraving or plate and one or more additional plates to reproduce the different shades, tints, or colors of a drawing. The several plates or blocks are printed in sequence, one block for each tone or tint. Registry or exact juxtaposition is secured by means of a transparent proof of the key-plate, and by the use of pins to which the sheet is fastened while the impression is being made. *(b)* A term applied to the handling of lights and shades in a picture; the art of representing light in shadow, and shadow in light, so that the parts represented in shadow shall have the clearness of those in light, and those in light have the depth and softness of the parts in shadow.

COATED—A general term applied to papers which are surfaced on one or both sides with an adhesive mixture of a mineral substance and glue, giving the paper a very smooth, glossy finish; for halftone printing.

COLLATING—*(a)* Examining the folded sheets of a book to see that the signatures are in proper sequence. *(b)* In proofreading, comparing copy and proof, word for word; a method used in reading dialect or foreign words.

COLOPHON—A few lines of information in a printed book, giving the date, place of production, emblem or name of the printer. Formerly the colophon was a note at the end of a manuscript book, giving an account of the work, place of copying, copyist's name, etc.

COMPLEMENTARY COLORS—Those pairs of spectral colors which, when mixed, produce white or gray light: red and blue-green, green-yellow and violet, yellow and indigo-blue. In pigments, those opposite colors which, when mixed, produce a neutral gray; thus blue is complementary to yellow-red; yellow is the complement of purple-blue; red is the complement of blue-green.

COMPOSING (not compositing)—The operation of setting type.

COMPOSING ROOM—That part of the printshop in which type is set, proved, imposed, locked up, and made ready for the printing press.

COMPOSING STICK—A metal tray with three sides, one of which is movable, used by compositors to hold the type while it is being assembled into lines.

COMPOSITION—That part of printing pertaining to typesetting, making up, etc. Also the composed type-mass, including leads, slugs, etc., ready for printing, produced by machine or by hand.

COPPER-THIN or BRASS SPACES—Copper spaces are ½ point in thickness; brass spaces are 1 point; both are made in sizes from 6 to 72 points, and are used for letter-spacing in display and close justification of lines.

COPPERPLATE ENGRAVING AND PRINTING—A method of engraving on copper, which was practiced before the invention of printing from movable metal types in Europe. It probably began in Southern Germany. The engraving is done on a plate of polished copper, and the impression is made on dampened paper, in a press, with a roller motion.

COPY—All written or printed material furnished to the printer, including manuscripts, illustrations, photographs, etc., to be used for the production of printed matter.

COPYHOLDER—(*a*) One who holds copy, reading it aloud to the proofreader. (*b*) A device for clamping or holding copy on the type-case or on a composing machine.

CRIBBLE (*Manière criblé*)—A manner of engraving on wood or metal, so as to give the effect of white dots on a black ground. To cribble means to cover with dots or small punctures, as was done in olden days on metal plates which were used on book covers and furniture, the dots frequently being filled in with enamel.

CROW'S-FEET—The small wrinkles or twists at the closed end, near the folding-line of a signature. They are caused by the air between the leaves, and sometimes by improper adjustment of the folding-machine.

CUT—A term often incorrectly applied to a relief engraving of any kind, or an illustration made therefrom. The word is a survival of the time when all illustrations used with type were wood-cuts.

CUT FLUSH—To trim the covers and inside sheets of a pamphlet exactly even; in distinction from overhang.

CUT-IN NOTE or SIDE NOTE—A note set into the side of a page of printed matter, usually in small type.

D

DAGGER—An old style of reference mark: †. *Double dagger,* ‡.

DANDY ROLL—A light wire cylinder attached to the wet-end of a paper-making machine. The web of moist paper passes under this dandy roll and receives the impression of the wires, the pattern of which determines the *laid* or *wove* lines on the sheet. Letters or designs on this wire cylinder produce watermarks.

DASHES—Pieces of rule or border, either plain or ornamental, used to separate various parts of type composition. Also cast in type units, in all sizes up to 24-point.

DEAD—A term which signifies that type or a printing form has been used and is ready to be distributed or taken down.

DECKLE-EDGE—The untrimmed feathery edge formed during the manufacture of paper. Hand-made paper has four deckle edges; machine-made has two.

DELETE—To remove, efface, or expunge; a proofreader's term.

DELINEAVIT—See *Fecit.*

DESCENDER—That part of a type character which descends or projects below the main body of the lower-case letters. The letters g, j, p, q, and y have descenders, and are called *descending letters.*

DEVIL—The errand boy or the youngest apprentice in a printing shop.

DIE—A binder's or engraver's stamp, made of brass or steel; also used by printers for embossing.

DIPTYCH—A double tablet, made of two pieces of wood, metal, ivory, or the like, fastened together with thongs, and covered with wax on the inside, upon which the Greeks and Romans wrote with a stylus.

DISPLAY TYPE—General term applied to sizes of type used for headings, advertisements, etc., in distinction from type used for plain reading matter.

DISTRIBUTION—Putting type, rules, leads, furniture, and other printing materials into their respective places after they have been used in a job.

DODGER—A small circular for hand-distribution; a *flier*.

DOUBLE or DOUBLET—In composition, the repetition of a word or a part of a sentence.

DOWN—A term in composition or copy-making to indicate that a capital letter should be made small, or lower-case. The order to "keep down" is given by drawing a diagonal line through the letter.

DRAW-SHEET—The uppermost or top sheet, drawn over the tympan of a press.

DROP FOLIO—The page number when placed at the bottom of the page, as on the first page of a chapter, the other folios being at the top of the pages.

DRY POINT—An intaglio engraving, made by means of a sharp needle on a handle, which is used to cut fine lines into a smooth metal plate, without the aid of a ground or etching solution. The print produced from such a plate is also called a *dry point*.

DUMMY—A plan of a book or job of printing, showing the size of the type pages, headings, margins, and general appearance of the proposed work; sometimes made up of proofs pasted into a booklet of blank pages. A *blank dummy* is one without proofs or lettering in it.

DUMP—The place in a composing room where dead matter is kept until it is distributed; also said of a standing galley or stand where compositors place or "dump" their composed lines to be assembled for proving, etc. See *Bank*.

DUODECIMO—A sheet folded so as to make twelve leaves, usually indicated by the abbreviation 12mo.

E

ELECTROTYPE—A copper- or nickel-faced duplicate, made from a page or form of type, engraving, or other relief surface, into a one-piece printing plate, by molding the original in wax. The mold is hung in an electrolytic solution, in which a metallic deposit produces a replica on the mold.

EM—The square of any type body. The common method of measuring type composition is by ems, the number of ems in a line being multiplied by the number of lines. The term is applied in many ways to printing material, as em-dash, —, em-quad, ■ em-leader, . . , etc. The pica em is the unit of measurement in the printing industry.

EMBOSSING—The process of raising or sinking a design or printed surface of cardboard between a pair of dies, one of which is usually made of metal. Embossing may be done by either a cold or a hot method.

ENAMELED PAPER—A sheet coated and calendered to a high gloss.

END PAPERS—The leaves placed at the front and back of books inside the covers; when double, one is pasted down on the cover.

ENGRAVING—The process or art of producing letters or designs on wood, metal, or other substances, by cutting or etching, for the purpose of printing or stamping on paper or other material.

ERRATA—A list of errors and corrections in a book or other printed work which are sufficiently important to be called to the attention of the reader; sometimes inserted at the beginning or at the end of a book, in other cases indicated on a printed slip which is tipped in beside the page containing the error.

ETCHING—The method of engraving on metal, glass, or other substances, by means of lines or strokes eaten into, or corroded with an acid, producing a depressed surface from which printing can be done.

EX LIBRIS—A label or book-plate, usually placed inside the cover of a book to indicate its ownership. The word is Latin and means *from the books of.*

EXPANDED—Applied to a type-face whose width is wider than the regular width of the other faces of the same family; also called *extended.*

F

FACE—Applied to type or to a form, that part which prints, as distinguished from the body or base; also used to express different styles of type, as a plain face, light face, bold face, etc.

FAC-SIMILE—An exact copy or reproduction of an original; often abbreviated *fac-sim.*

FAN OUT—To separate the sheets in a pile by moving the upper sheets out sideways; to rub out.

FECIT—A Latin word meaning *he has made it,* often added to an artist's name on an engraving or picture; *delineavit* (del.), meaning *he drew it,* is sometimes seen on old prints or drawings.

FEED EDGE—The edge or side of a form, while it is locked in a chase on a cylinder press, that comes nearest to the feed-gages as the sheet is printed.

FEED-GUIDES—Any one, or any pair, of several kinds of appliances for holding the paper sheets in a uniformly straight position while the impression is being made; a feed-gage or pin.

FILLER—A substance like china clay or other mineral matter used for filling the interstices between the fibers, to add weight and opacity to paper as well as give it a better printing surface.

FINIS—A Latin word used at the end of a book.

FIST or INDEX—A common name for the index-mark; also called a *hand.*

FLIER—A small sheet or dodger; a handbill.

FLORET—A small flowery ornament, cast on a type-body.

FLY LEAF—A blank leaf at the beginning or end of a pamphlet, or a book.

FOLIO—(*a*) A size of paper, 17 by 22 inches. (*b*) A book size indicating a sheet folded once. (*c*) The page number on pages of books and pamphlets.

FOLLOW COPY—A direction to the compositor which indicates that he is to regard the copy as perfect and make no changes whatever.

FONT—A complete assortment of any style or size of type, containing proper proportions of each character according to its frequency of use in composition.

FOOT-LINE—The bottom line on a page, usually blank; sometimes it may contain the page number or the signature mark.

FORM—An assemblage of type matter, electros, quoins, etc., locked up in a printer's chase.

FORMAT—A term used to designate the general style of a book or other piece of printed matter, showing the size, proportion of pages, margins, etc.

FRISKET—A contrivance attached to the tympan of a platen press, in order to prevent certain parts of a form from printing on the sheets as they are fed in; the type prints against the frisket instead.

FURNITURE—Pieces of wood or metal, less than type-high, used for filling blank spaces in setting type or making up forms; made in various dimensions or sizes which are multiples of picas.

G

GAGE or GAUGE—(*a*) A piece of wood or metal (reglet, slug, or brass rule) used to determine a measure of any kind, to preserve uniformity in the length of pages, position of form, width of margin, or similar purpose. *(b)* A piece of cardboard, wood, or metal fastened on the tympan of a job press as a stationary guide to locate and hold the sheets in feeding. See *Line-Gage*.

GALLEY—A shallow metal (sometimes wooden) tray used by printers as a receptacle for composed type or other printing surfaces, either before or after the printing has been done, or while proofs are being taken.

GALLEY LOCK—A special device for holding type in place on the galley while proofs are being made of the type.

GANG PRINTING—Printing done with a form or group of plates or type arranged to be run off together at one impression. A sheet thus printed.

GARAMOND TYPE—A family of beautiful "modernized" roman type faces, the design of which is based upon the letters designed and cut by Claude Garamond in 1540. This is 8-point Garamond.

GATHERING—Collecting the folded sheets or signatures of a book or pamphlet side by side in consecutive order, preparatory for binding.

GELATIN PRINTING—See *Photo-Gelatin Printing*.

GOLDEN TYPE—One of the type-faces designed and cut by William Morris of the Kelmscott Press. Morris modeled his type after the design of Nicholas Jenson, a Venetian printer of the fifteenth century.

GRANJON—A book type-face designed by Mr. George W. Jones, one of England's great printers. It is a clear, sharp, and beautiful type, and although neither an oldstyle nor a modern face, it is worthy to be ranked with Caslon Oldstyle. Various sizes of Linotype Granjon are used in the pages of *Hand Composition*.

GRAPHIC ARTS—Printing, engraving, lithographing, drawing, painting, and all other fine arts which pertain to the representation of objects on a flat or nearly flat surface, are now included in the general term of graphic arts.

GRAVER—An engraver's tool for cutting, chasing, etc.; a burin.

GRIPPER MARGIN—The edge of the sheet that is caught by the gripper fingers on a cylinder press. Also called *gripper edge*.

GRIPPERS—On platen presses, the metal fingers which hold the sheet in place while it is being impressed and which take it off the type afterward; on cylinder presses, the device or clamps which grip and carry the sheet around the cylinder while it is being printed; also called *nippers.*

GUARDS or GUARD-LINES—Strips of metal, type-high or a little higher, placed around type forms which are to be electrotyped. See *Bearers.*

GUIDE-LINE—A mark or indication on copy to show to which part or section of a story a piece of copy belongs. A large slug, placed at the top of a galley, as a mark of identification.

GUTENBERG BIBLE—The *42-Line Bible,* printed by Johann Gutenberg of Mainz, Germany, about 1453 to 1456. This Bible was the first complete book printed from movable types in Europe. A copy of it was discovered in the library of Cardinal Mazarin, in Paris, about 1759, and formerly it was called *Mazarin Bible.* Because most of the pages have two columns of 42 lines each, this Bible is generally referred to as the Gutenberg *42-Line Bible.*

GUTTER—The blank space which gives the back, or binding, margin of a book-sheet.

H

HAIR-LINE—Used as an adjective or noun to describe any very fine or delicate line in type, brass rule, or engraving.

HAIR SPACES—Very thin spaces, less than five-to-an-em. See *Copper-Thin or Brass Spaces.*

HALF-DIAMOND INDENTION—When successive lines are indented at both ends, each one being shorter than the preceding line, as in this paragraph;
very frequently used in display composition.

HALFTONE—An engraved plate produced by photographic and chemical methods, in which the printing surface is composed of a series of fine dots. The plate is made by photographing a picture through a screen interposed between the copy and the sensitive glass plate in the camera. As the light passes through the screen, the object on the negative is broken up into a mass of minute squares, or dots, which are larger or smaller as the corresponding parts on the copy are darker or lighter. The screened negative is then placed against a polished, sensitized zinc or copper plate, and, after exposure to light, the metal plate is developed and manipulated so as to bring out the image. Finally the plate is mounted on a wood block or beveled so that it may be attached to a patent base.

HALFTONE PRINTING—In the graphic arts, the term halftone includes all printed pictures in which there appears a gradation of tones or values, and in which the lights and shades are defined by dots of different surface areas made through mechanically-lined screens. The screen can be in single or double straight lines, in wavy lines, in two lines crossed, or four lines crossed. Pictures produced with the aid of these screens, whether printed by the relief, intaglio, or planographic method, may be correctly called halftones. The lights and shades of such pictures are broken up into dots of different areas; the highlights are the black dots, the middle tones or halftones are usually a checkerboard pattern, and the shadows have only a diminishing white dot.

HANDBILL—A small printed advertisement or notice, intended to be passed to persons on the street, or left at doors. See *Dodger.*

HANGING INDENTION—That style of paragraph which is set with the first line full length and subsequent lines indented on the left or on both sides; usually employed in dictionaries, price-lists, etc.

HEADPIECE—An ornamental panel or picture placed at the top of a page in a book or other printed work.

HIGH-TO-PAPER—The height of a type, as compared with its mates; 0.918 inch is the standard height for all letterpress types in this country.

HOLLANDER—A name given to the pulp-washing and pulp-beating and mixing machine in the paper mill; invented in Holland about 1750.

HORNBOOK—A contrivance (not a book in the usual sense of the word) which existed before the invention of typography in Europe, and which was designed to provide an indestructible school-book for boys. The hornbook was a small broadside, printed from wood-blocks, made up of the Latin alphabet at the top, in capitals and small letters, a list of vowels, a number of the commonest syllables, and the Lord's Prayer. The single leaf was set into a wooden frame, fashioned with a handle at the bottom, and in the handle there was a hole, so that the "book" could be slung to a boy's belt. The printed sheet was protected with a thin sheet of transparent horn.

HOUSE ORGAN—A publication issued periodically by a corporation or business concern for its employees, salesmen, and customers; intended to advertise its products and promote the welfare of the company and its employees.

HYPOTENUSE OBLONG—A rectangle whose mathematical ratio of width to length is as 70.71 is to 100 per cent, and this ratio is not changed by folding the sheet through its longest dimension. If the length of a rectangle is divided by the width, it gives the multiplying factor, which in the hypotenuse shape is 1.4142. Seven and one-half by ten and five-eighths is a well-known hypotenuse letter sheet. Its dimensions are determined by the hypotenuse of a right-angle triangle.

I

ILLUMINATING—The decoration of book pages and manuscripts with colors and gold. In old manuscript and early books, the initial letters, borders, headpieces, and pictures (miniatures) were beautifully painted by hand.

IMPOSITION—The operation of placing a number of pages or parts of a form in such a manner that, when the sheet is printed and folded, the pages or parts will follow each other in consecutive order.

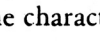
IMPRESS—The process of making marks or impressions; the impression.

IMPRIMATUR—Imprint; granting permission to print.

IMPRINT—The name and address of the printer or publisher on his work, usually placed inconspicuously; a trade-mark, or printer's mark.

INCUNABULAE—A Latin term signifying *in the cradle*. It is applied by bibliographers to books printed before 1500, or while the art of printing in Europe was in its infancy.

INDENTION—In common paragraphs of composition the first line is begun a little farther away from the margin than the succeeding lines, and is said to be indented. The usual indention of paragraphs is one em-quad of the size of type used.

INDEX—*(a)* A table, arranged in alphabetical order, for facilitating reference to topics, names, etc., in a book. *(b)* The character  , called by some compositors *hand* or *fist.*

INDIA TINT—A light buff or yellowish shade, applied to paper.

INFERIOR LETTERS AND FIGURES—Small letters or figures cast at the bottom of the type-body, as opposed to superior letters or figures, used for reference marks, equations, formulas, etc.

INITIAL—A large letter, plain or ornamental, which is inserted at the beginning of the first word of a page or other piece of printed matter. Initials are sometimes used to introduce chapters in books.

INK-BALLS—Round cushions, stuffed with wool or similar material, each with a handle, and used in pairs, before the invention of the modern composition roller, or the brayer.

INSERT—A separate sheet, usually of heavier or different quality of stock from the rest of the work, and inserted in proper position before the magazine or book is bound.

INSET—A sheet or folded section placed within another.

INTAGLIO—Engraving incised or cut into the surface of wood or metal, in distinction from engraving in relief. Copperplate and steel engraving are intaglio processes.

INTERLAYS—Interlays or innerlays are sheets of paper placed between engravings and the bases upon which they lie when being printed; used in making the form ready.

INTERTYPE—A slug-casting and composing machine, built upon the basic mechanical principles of the Mergenthaler Linotype. The Intertype embodies certain changes and improvements over other similar machines.

ITALIC—An inclined or sloping type-face; first made by Aldus Manutius, of Venice, Italy, and used in printing a copy of *Virgil,* in 1501.

IVES PROCESS—The process of making three-color printing plates and the method of using them, invented by Frederick Ives of Philadelphia. See *Process Color Printing.*

J

JACKET—*(a)* A four-page unit or section of a book or catalog, usually placed around or on the outside of the other signatures or sections. *(b)* A separate cover, usually of thin or flexible paper, bearing the title and description of the book.

JAPANESE FOLD—In Japan it has been customary for many years to print and also to hand-letter books made of very thin paper. Before the invention of the pen, this work was done with a brush. Because the paper was naturally absorbent, the characters showed on both sides, although only one side was inked. In order to avoid this, the sheet was folded in, the blank sides together, so as to make the lettering legible. This is the origin of the *Japanese* fold. In France, when thin paper is utilized for printing purposes, the same procedure is followed, and in Europe this has come to be known as the *French* fold. In the United States, any sheet which is printed on one side only and then folded so as to conceal the unprinted side is known as Jap or French fold.

JENSON—The name of an oldstyle roman type-face. The modern type was made by William Morris, in England, about 1890, who modeled it after the roman letters of Nicholas Jenson, a famous Venetian printer of the fifteenth century. Jenson

produced the first true roman oldstyle type-face in 1470. Morris called his letter "Golden" type. The design was introduced to American printers by the American Type Founders as *Jenson Oldstyle.*

JOB FONT—A small assortment of type of one style and size.

JOB TICKET—A ticket or envelope accompanying a job, usually bearing full instructions regarding the work to be done; also called *job envelope.*

JOG—To push or shake gently into a compact pile sheets of paper, before or after they have been printed; to even up the edges of a pile of sheets.

JORDAN ENGINE—A machine used in the paper-making industry for refining the pulp or *stuff.*

JOURNEYMAN—A printer who has served his apprenticeship, and is recognized as a full-fledged workman.

JUSTIFIERS—Very thin spaces, like copper-thins, brasses, etc.

JUSTIFY—To space lines of type in order to make them of equal length with their mates, so that they may be locked up solidly; to add spaces or quads, sometimes leads, so that a small and a large size of type may be made to occupy the same depth in a line or in a mass of type.

K

KEEP DOWN—A direction to use capitals sparingly, and to keep type-matter down to lower-case letters as much as possible.

KEEP IN—To set type closely spaced; to contract. *Keep out* signifies to set type widely spaced; to expand.

KEEP UP—To use capitals freely, and to capitalize words which might otherwise begin with lower-case letters.

KERN—That part of a type-face which projects beyond the body or shank.

KERNED LETTERS—Those letters which have a part of the face projecting over the body, as f, j, and y in roman alphabets; in italic fonts the d, g, j, l, and y are usually kerned on one side of the face, and the f on both sides.

KEY-DRAWING—An outline drawing furnished to a lithographer or engraver as a guide for making the color separation in producing a set of plates for use in color-printing.

KEY-PLATE—Any printing plate that is used as a guide to get the other plates of the same set into register. In three-color process work, the blue plate is usually used; in the four-color process the black is the key-plate. The key-plate contains the greatest amount of detail.

KILL—To delete or eliminate copy or printed matter; to indicate that composed matter is not to be used or is ready for distribution.

KÖNIG PRESS—The first practical power printing machine of the "platen" press style was invented in 1811 by Friedrich König, of Saxony, Germany. Soon afterward König devoted his attention to constructing a press that would print by means of a cylinder. His first press was used by the London *Times,* on Nov. 28, 1814. The press was operated by steam and produced about 400 impressions an hour.

KRAFT—The term is derived from the German "Kraft," meaning strength, and is applied to a naturally colored, strong paper made from sulphate pulp, used mainly for wrappings.

L

LABEL—A slip of paper, either gummed or ungummed, usually printed, to be attached to packages, etc.

LABEL-HOLDER—Narrow strips of brass, for type-cases, drawers, etc., into which a card may be slipped.

LAID PAPER—Paper which is watermarked with close, fine, parallel lines crossed with other less frequent lines at right angles to the fine lines.

LAY OF CASE—The plan or scheme of arrangement for the characters in the different type cases of the printshop.

LAYING TYPE—Placing a new font of type in the respective boxes of the case.

LAYOUT—A preliminary sketch or plan of arrangement for a piece of printed matter, used as a guide for the compositor. A layout usually indicates the style and sizes of type, and shows the general grouping of the matter.

LEADED MATTER—Type lines which are separated with leads, in distinction from solid matter, which has no leads between the lines.

LEADERS—Type characters cast on bodies of an en, em, and multiples of ems, for printing dotted or hyphen lines.

LEADS (pronounced *leds*)—Thin strips of lead of varying thickness used between type lines to spread the lines apart more or less.

LEAF—Each separate sheet of paper in a book or other printed work; a leaf has two pages.

LEGEND—A brief description printed below an illustration; erroneously called *cut-lines*.

LETTERBOARDS—Movable shelves, under imposing stones, in racks, or elsewhere, upon which standing type forms are kept.

LETTERHEAD—*(a)* A printed heading on writing paper. *(b)* The sheet of paper used for writing commercial letters. The most common size is 8½ by 11 inches.

LETTERPRESS PRINTING—Anything printed with raised characters or ordinary printers' types.

LETTER-SPACED—Said of words of type which have thin spaces between the letters: used in display composition.

LIFT—*(a)* A composed job or form is said to lift when it can be locked up so that it may be lifted from the imposing stone without having any of the types drop out. *(b)* A lift of paper is the quantity of sheets put on the feedboard of the press at one time.

LIGATURES—Two or more letters cast on the same body, as fi, ff, fl, ffi, ffl, æ, œ, ſt, and others.

LIGHT-FACE—A term used to describe a style of type which has fine or delicate minor and major strokes, causing it to print in a gray mass, rather than in a black mass.

LINE-DRAWING—An outline drawing or sketch in ink or crayon, from which a line engraving can be made.

LINE ENGRAVING or ETCHING—A zinc or copper plate with a relief surface, made photo-mechanically without the use of a screen, from a drawing or print.

LINE-GAGE—A printer's measuring rule, usually graduated into picas and nonpareils, but frequently showing other type-size graduations, as 8-point, 7-point, etc., and the inch-scale.

LINEN FINISH—In the paper industry, a finish impressed on the sheet to resemble linen; usually produced by placing paper between sheets of linen cloth and zinc plates and subjecting it to pressure.

LINING—When the bottoms of the letters of a font of type are in exact alignment horizontally they are said to be "lining" or aligned. All lining types are so cast by type founders that all letters of fonts of the same style will align at the lower end.

LINING FIGURES—Numerals of modern style that are cast so that they will line together at the bottom. Oldstyle figures do not all line at the bottom or at the top.

LINOGRAPH—The trade name of a slug-casting composing machine, similar in mechanical principle and operation to the Linotype.

LINOLEUM BLOCKS—Relief printing surfaces or blocks cut from linoleum. They are produced in a manner similar to that of wood-block cutting, the work being done by hand, with knives and gravers. Linoleum blocks are not very durable, but under favorable circumstances they can be electrotyped to make duplicate plates.

LINOTYPE—The name of the composing machine invented by Ottmar Mergenthaler about 1885. This is a slug-casting machine which automatically assembles and casts a "line-o'-type" on a slug of metal, from which printing may be done direct. After the matrices from which the slug is cast have been used they are distributed by the machine into a magazine and used over and over for the succeeding lines or type-slugs.

LITHOGRAPH—A print produced by lithography.

LITHOGRAPHIC INK, CRAYON, or CHALK—A greasy substance, manufactured in various forms, for use by lithographers for drawing a design on stone or metal.

LITHOGRAPHIC STONE—A stone, having special qualities, found in Bavaria, and to some extent in other parts of the world. It is commonly called soapstone, and upon its flattened surface is drawn the design which is to be printed from.

LITHOGRAPHY—From two Greek words, *lithos,* a stone, and *graphein,* to write; therefore, stone-writing. The art of lithography was accidentally discovered by Alois Sennefelder, the son of an actor, of Munich, Germany, in 1798. The process consists of drawing a design on a flat piece of soapstone with a fatty crayon, chalk, or ink, which dries on the surface of the stone. This is then subjected to the action of a weak acid, which hardens the ink, and slightly etches and lowers the unprotected parts. In printing from the stone it is necessary first to moisten the surface with water, which is absorbed by the blank parts of the stone, and is repelled by the ink or crayon of the design. When printing ink is rolled over the stone, it adheres only to the design. Thus it will be seen that lithographic printing is based on the antipathy between grease and water.

LIVE MATTER—Type set up and ready for use, or to be kept for future use. After it has been used and is no longer required as it stands, it is called dead matter, and is ready for distribution.

LOADING—A substance, as China clay, kaolin, and the like, used in paper-making as a filler or to add weight to the paper sheet.

LOCKING UP—The act of tightening or locking a form by means of quoins, screws, or other devices, and so preparing it for printing on a press.

LOCUS SIGILLI—Latin, meaning *the place of the seal;* the initials L. S. placed before signatures in legal documents, etc.

LOFT-DRYING—A method of drying the highest grades of paper, by hanging, while still wet, from surface size, over poles in a warm, uniformly heated loft, where the paper is allowed to dry and season.

LOGOTYPE—A single type-body containing two or more letters, or a syllable or short word, as *it, of, the, and,* etc.; also a design or trade-mark cast on a single type-body. (*Logotypes* differ slightly from *ligatures.*)

LONG CROSS—The bar in a chase which divides it across the longest way or dimension. The shorter bar is called the *short cross.*

LONG-LETTER—One that has both ascending and descending strokes, like the italic *f,* j, and Q, or any letter so made that it covers the type-body up and down.

LONG PRIMER—The old name of a size of type, between bourgeois and small pica, equal to 10-point in the American point system. The Germans call this size *corpus;* the French name for it is *petit romain.*

LONG S—The oldstyle roman lower-case ſ, now obsolete, except in reprints or in imitation of oldstyle work. It is still used in German type fonts.

LONG TWELVES—A plan of imposition in which the pages of a 12mo form are laid down side by side in two rows of six pages each.

LOW CASE—A type case with little type in it. A case is said to be *empty* when important boxes contain no letters.

LOWER CASE—The lower, or under case of the usual pair of cases as they lie on the compositor's frame. Being nearest to his hand, it contains the letters and characters most frequently used, namely, the small letters of the alphabet, and spaces, quads, etc.; hence, these small letters are called lower-case letters even when placed elsewhere, in order to distinguish them from the capitals and small capitals.

LOW IN LINE—Type whose face is lower on the body than that of its mates, in contrast to type which is high in line.

LOW SPACES AND QUADS—Those in common use, as distinguished from high spaces and quads, which are used in type composition that is to be utilized exclusively for molding and making of electrotypes.

LOW-TO-PAPER—Said of type, electros, engravings, or other printing surfaces, when their faces do not come up to the height of the rest of the printing form, being less than 0.918 of an inch. See *High-to-Paper.*

LUDLOW TYPOGRAPH—A slug-casting machine, used largely for the casting of display lines, borders, rules, etc., of various sizes and styles.

M

MACHINE-DRIED—Paper dried on the paper-making machine by passing the damp paper over steam-heated drums or cylinders.

MACHINE FINISH—A finish, usually on book paper, obtained by pressing the sheet through the calender stacks at the end of the paper machine. The term is also applied to uncalendered paper as it comes off the last drier. Abbreviated M. F.

MACKLE—When part of the impression appears double because of a shifting of the paper while being printed, it is said to be mackled.

MAJUSCULE—A capital letter, employed in the earliest form of Latin writing. After a time the scribes developed small letters, which are called minuscules.

MAKE-READY—After a form has been locked up, all the operations necessary to prepare the form on the press for printing. Make-ready includes setting the gages, underlaying and overlaying, etc., in order to give each part of the form the proper impression, so that the job will print clearly and evenly.

MAKE UP—To arrange lines of type into pages, or columns, with headings, folios, etc., for printing.

MAKE-UP RULE—A steel rule having a projection on top and sharpened slightly on the bottom, used by printers in making up forms or pages.

MALLET—A wooden or rawhide hammer, used for planing down printing forms, or for beating proofs on an imposing table or stone.

MALTESE CROSS—A cross or sign used in religious printing. ✠

MANIFOLD PAPER—A thin, light-weight paper, for copying or duplicating purposes; onionskin.

MANILA—A strong grade of paper, formerly made of Manila hemp, used for tags, wrappers, etc. The term is also applied to any paper of a yellowish color, whether made of Manila hemp or not.

MANUSCRIPT—Handwritten or typewritten words for the printer or publisher. Abbreviated Ms. or MS.; plural, MSS.

MARBLING—A process of decorating sheets of paper and edges of books with variegated colors of irregular patterns.

MARGIN—That part of a sheet or page not covered by written or printed matter; the blank space at the top, bottom, and sides of a printed page or form.

MARGINAL NOTES—Side-notes, usually set in smaller type than that used as the body-type of the page, and placed in the margin.

MATHEMATICAL SIGNS—The marks or special characters used in the science of numbers and quantities.

MATRIX—*(a)* The shallow mold in which the face of type is cast. *(b)* The papier-mâché mold made from a page of type for stereotyping. (*c*) A plaster, wax, or lead mold of a printing form or surface containing an impression, from which to produce a duplicate by the electrotyping process. Often called *mat*. The small brass plates, having intaglio letters on one edge, used in slug-casting machines, are called matrices.

MATTER—A term applied to the printer's copy and also to composed type.

MEASURE—The width or length of a line of type, usually calculated in pica ems.

MEDIUM—A size of printing paper, 19 by 24 inches. The size of double medium is now often given as 25 by 38.

MENU—A bill of fare in an eating-house.

MERGENTHALER LINOTYPE—See *Linotype*.

METAL FURNITURE—See *Furniture*.

MEZZOGRAPH—A halftone plate that is made from a negative photographed through a screen having a grain structure instead of cross lines. This produces a texture not unlike the box-grain in appearance. In etching and re-etching most of the fine grains in the highlights disappear, leaving open spaces which give a coarse, grainy appearance to the highlights.

MEZZOTINT PROCESS—A method of engraving on copper, called by the French *Manière Noire,* and by the Germans *Schabkunst.* The surface of a smooth metal plate is first lined off in sections and is slightly roughened by a steel rocker which has teeth on a curved frame. This produces a plate having innumerable small, deep holes, which will hold the ink. After the design is traced on the plate, the roughened metal is removed with a scraper wherever highlights are desired. The mezzotinter works from black to white by scraping the copper away until the holes made by the rocker have been removed from all parts except where deep shadows are required. The printing is done with special ink on suitable paper, which must be damp. An impression made from a mezzotint plate is also called *mezzotint.*

M. F.—See *Machine Finish.*

M. G. PAPER—Machine-glazed paper; one side glazed, the other rough.

MICRON—A unit of light-wave measurement, equivalent to a thousandth part of a millimeter, or the millionth part of a meter. Abbreviated μ.

MILL BRAND—The trademark and brand belonging to a paper manufacturer and so identified by jobbers and printers.

MINION—A size of type, between nonpareil and brevier; 7 points in the point system.

MINUSCULE—A small roman manuscript letter, developed from the uncial letter. See *Majuscule.*

MITER—To bevel the ends of brass rules or other lines so that they will join at the angles on corners; done on a mitering machine.

MISSAL—A book containing the prayers and ceremonies for the entire year. *Missal initials* are large decorative letters fashioned after the initials used at the beginning of paragraphs in old manuscript books.

MO—A Latin suffix, used in such words as duodecimo (12), octodecimo (18), etc. In present-day usage the letters *mo* are added to numerals in order to indicate the number of leaves made by folding a sheet of paper, as 12mo for duodecimo, 16mo for sextodecimo, etc. See *Octavo.*

MODERN—When applied to type styles or type faces, the word modern designates type having straight serifs, thin hair-lines, and relatively heavy down strokes, as shown in Bodoni type.

MOLD—On a typecasting machine it is that part in which the body and face of the type are cast. In making paper by hand, it is a wooden frame enclosing a wire screen on which pulp is formed into sheets.

MONOTYPE—A composing machine, bearing the trademark *"Monotype,"* which casts single types in the order of their use and sets them into automatically justified lines of any length up to 60 picas. The machine was invented by Tolbert Lanston of Washington, D. C., and the first commercial model was shown in operation in 1895. The Monotype consists of two parts, a keyboard-stand and a caster. At the keyboard an operator depresses the keys, which perforate a paper tape with symbols. These symbols conform to certain characters in the matrix-box of the casting mechanism, and thus cast the type when the tape is fed into the caster.

MORTISE—Cutting a cavity or space into or through an electrotype or other printing plate so that type-matter may be inserted in the opening.

MOTTO—A word, phrase, or maxim, expressing an aim or ideal. A motto may consist of one or several sentences; a slogan.

MOUNTED—Electrotypes or engravings are mounted on blocks of wood or metal to make them type-high. Said of a print or sheet that is mounted or pasted on a larger sheet or card.

M'S or M PAPER—Paper which is not up to the standard quality of manufacture, though in some cases the imperfections may be very trivial.

MUSIC PRINTING—See *Note Printing.*

MUTTON QUAD—An em quadrat. For clearer distinction in speaking, printers call the em *mutton,* and for the same reason the half-em or en quad is called *nut* quad.

N

NATURAL—In paper parlance, it indicates an India or light buff (brownish-yellow) tint or shade.

N. B.—The abbreviation for the Latin words *nota bene,* which mean *note well,* or *take notice.*

NECK—That part of a type-letter which is between the shoulder and the face; usually called the *beard.*

NEWS—Any thing or subject pertaining to newspaper work, material, and equipment; a report of a recent happening in any region (N E W S); a soft-sized paper made principally of ground wood, used for printing newspapers.

NEWS CASES—A pair of cases, consisting of an upper or capital case, and a lower case for small letters, in common use in composing rooms of newspapers before the introduction of typesetting machines. News cases have been superseded almost entirely by the California, New York, and the Yankee Job cases.

NEWS STICK—A composing stick with a fixed measure, as for the established width of a newspaper column.

NEW YORK JOB CASE—A style of case which has accommodations or boxes for the capitals, small capitals, lower-case letters, points, and figures contained in a complete job font.

NIB—The small ear or projection on the end of a composing rule.

NICK—The notch or groove cast crosswise on the lower shank of a type character to indicate the foot and help the compositor in placing his types right-side up in the composing stick. Nicks in the type also aid in distinguishing one style or font of type from another.

NICKELTYPE—A duplicate printing plate, similar to an electrotype, made by first depositing a coating of nickel (or nickel-steel) on the mold, and then depositing copper until the proper thickness of the shell is reached. After that it is finished in the same manner as an electrotype. Nickeltypes are more durable than electrotypes, and are not chemically affected by red inks, as copper is.

NIEPCE, JOSEPH NICÉPHORE (1764-1833)—A French lithographer who, with Louis Daguerre, was the first to make photographs, then called *Daguerreotypes*). Niepce is also credited with being the first person to have made a photo-engraving through the discovery of a light-sensitive medium composed of asphaltum dissolved in a special oil, which he used on a metal plate that was afterward etched.

NIGGERHEAD—A black mark on the printed sheet opposite the side-gage, produced by driving a small nail into the furniture of the form on the press. This black spot, or niggerhead, as it is called, helps the pressman in seeing that the sheets are fed to register correctly when the sheets run through the second time.

NONPAREIL—A size of type equivalent to six points, coming between agate (5½-point) and minion (7-point).

NON-RANGING FIGURES—The same as *non-lining*. See *Lining Figures*.

NOTA BENE (pronounced *no-tā' bĕné*)—From the Latin, meaning *note well,* or *take notice*. Abbreviated N. B.

NOTE—An explanatory phrase, sentence, paragraph, or brief statement, usually set in smaller type than the main text, like footnotes, side-notes, etc. Note of exclamation ! note of interrogation ? A written or printed communication; an acknowledgment of a debt, either written or printed.

NOTEHEAD—A small-sized correspondence sheet (approximately 5½ by 8½ inches), either printed or unprinted.

NOTE PRINTING (Ger. *Notenstich*)—Printing plates for sheet-music may be produced in several ways. If the copy is reprint, it is usually reproduced photographically. Original manuscript, if not intricate, may be set in note-type, and then an electrotype, stereotype, lithograph or other duplicate plate made from the type or proofs thereof. When the copy contains difficult note arrangements, a good method is as follows: A smooth plate of zinc or lead, upon which lines or bars have been incised, forms the negative plate upon which all characters are made with steel punches or needles. The note-puncher has before him a set of punches, and he takes one character at a time, places it in position on the plate; with a gentle tap from a hammer he impresses it upon the plate. Unusual characters must be engraved by hand. After the notes and text-matter (words) have been punched in, a proof is taken and corrections are made if necessary. Finally a transfer is made from this negative plate, and this proof serves for making the plate for the lithographic or offset process by which most of the music-printing is done.

NUMBERING MACHINE—A compact mechanism for printing numbers in consecutive order, either singly, in duplicate, or triplicate, as on tickets, checks, etc.

NUMERALS—The Arabic and Roman characters used to express numbers.

NUT QUAD—The printer's slang term for en quad. See *Mutton Quad*.

O

OBELISK—Another name for the reference mark of the dagger, which see.

OBLONG—A page or sheet that is wider than it is high, with the reading matter running the long way; the opposite of an upright or the common style of page or sheet.

OCTAVO—A sheet of paper folded into eight leaves or sixteen pages. When sheets are folded to contain more than eight leaves, the terms are usually abbreviated, as 10mo, *decimo;* 12mo, *duodecimo;* 16mo, *sextodecimo;* 18mo, *octodecimo,* etc.

OCTODECIMO—*(a)* A sheet folded into eighteen leaves or thirty-six pages. *(b)* A book size, about 4 by 6 inches.

ODD FOLIOS—The numbers which come on the first side of the leaf, as 1, 3, 5, 7, etc. The even folios are on the second side of the leaf, as 2, 4, 6, etc.

OFFCUT—A small part or section of a signature. The pages are imposed in such a manner that the sheet must be cut before it is folded, as in a twelve-page sheet, which is to be divided into a four-page and an eight-page section for folding, and then one section is set into the other to make the twelve-page signature.

OFFICE CORRECTIONS—Proofreader's changes, to correct errors made by the printer in composition. See *Author's Alterations.*

OFF ITS FEET—Type must stand squarely upright in order to give a sharp, clear impression; when it leans one way or the other it is said to be *off its feet.*

OFFSET—When the face of a freshly printed sheet rubs and smuts the one below or on top of it.

OFFSET PRINTING—A process of lithographic printing, in which the design or subject is drawn or photographically reproduced on stone or metal. The imprint is made from a flat stone or flat or curved metal plate on a rubber blanket from which the wet impression is offset on the paper sheet or roll.

O. K.—An abbreviation of the corruption *oll korrect,* indicating a mark of approval. *O. K. with corrections* is used on proofs to signify that they are correct with minor corrections or changes noted thereon.

OLD ENGLISH—A style of text- or black-letter, made in many varieties, said to be modeled after the type used by Gutenberg in the *42-Line Bible.* **This is 8-point Old English.**

OLDSTYLE—A type-face which is characterized by oblique serifs. In general, oldstyle faces follow the form of Caslon Oldstyle, the Elzevirs, and Cloister Oldstyle.

ONIONSKIN—A thin, transparent, highly glazed, or unglazed paper made of rag and sulphite, used principally for manifolding purposes.

OPACITY—The property of being opaque or non-transparent.

OPEN PUNCTUATION—A style of punctuation in which few marks of punctuation are used.

OPTICAL CENTER—That place on a printed page which the eye seems naturally to seek as a focal point or center. It is slightly above the geometric or mathematical center, and is approximately one-third to three-fifths of the distance from the top of the page.

ORNAMENT—Any floret, design, or decoration used in composition for embellishment.

OUT, or OUT, SEE COPY—A mark calling attention to something omitted from composed type-matter, usually placed in the margin of a proof, and directing the compositor to refer to the copy.

OUTER FORM—The form which contains the first and last, or outside, pages of a signature when the work is done *sheetwise.* The *backing-up* form is called the *inner* or *inside form.*

OUTLOOK ENVELOPE—A trade name for an envelope having on its front side a panel, with a transparent cover, through which the address on the inside sheet can be read. Also called *Window,* or *Transo* envelopes.

OUT OF REGISTER—When two or more colors of a job do not strike in proper relation to each other, the work is out of register; similarly, when the pages on both sides of a sheet do not back each other accurately, the sheet is out of register.

OUT OF SORTS—When any letter or character in a type font has been all set from the case, the case is *out of sorts.* When there is a deficiency in several characters, the case is said to be *empty.*

OVERHANGING—A cover which projects over the inside leaves of a booklet or other printed work.

OVERLAY—A piece of paper or other material pasted on the tympan-sheet of a press in order to give more impression to a letter, line, or part of an engraving. Overlays are also made by etching an inked impression on a thin sheet of zinc, or a specially prepared thick paper, printed with a special ink. After the zinc or paper has been properly etched, so that the light parts are eaten away and the dark parts or shadows remain, the overlay is fastened to the tympan-sheet and a top-sheet drawn over.

OVER-RUN—*(a)* In typesetting, to carry words from the end of one line to the beginning of the next; over-running is done in making corrections, and to avoid a series of divisions at ends of lines. *(b)* In printing, to print a greater number of copies than the quantity ordered. *(c)* In paper-making, an excessive quantity of paper made on an order.

OVER SHEETS—Signatures or sheets left over after all complete copies have been gathered. Extra sheets are usually allowed for spoilage.

P

PACKING—That part of the tympan of a press which is beneath the *draw-sheet,* usually of paper, but sometimes other material; its purpose is to increase and improve the impression.

PAD—A number of sheets of one size, assembled and glued on one or more edges, forming a block; a *tab* or tablet of paper.

PAGE—One side of the leaf of a book or of a sheet of paper when folded; a page of type is a composed form to be printed on a paper page.

PAGE CORD—The twine or cord used for tying up jobs of composition or type-pages.

PAGE-GAGE—A measure to determine the length of pages of type for a book or other work.

PAGINATION—The numbering of the pages of a book or catalog.

PALIMPSEST—The term denotes a parchment or other manuscript sheet which has been written upon twice, the first writing having been wholly or partly erased or removed to make room for the second; double or triple use of writing material was common among the scribes of early days.

PAMPHLET—One or more printed sheets, folded and stitched together but not bound like a book.

PANEL—A space, rectangular (sometimes square) in shape, enclosed by rules or borders or other decorative material; a box.

PAPER—The thin, flexible material upon which nearly all printing is done, the word being derived from the Egyptian *papyrus.* Paper is made from many varieties of vegetable fibers, the most common of them being linen and cotton rags, hemp, jute, esparto, straw, and wood.

PAPETERIES—Various kinds of writing papers, usually of good quality, for boxed stationery use.

PAPIER-MÂCHÉ—Mashed paper; a substance made of paper pulp mixed with rosin, glue, clay, etc., so that it may be formed into any desired shape while soft. *Papier-mâché* is also used for making stereotype matrices, which in that case consist of blotting paper and tissue, pasted together.

PAPYRUS—An ancient paper, made originally by the Egyptians from the inside of the reed of the papyrus plant by cutting it into thin strips, which were arranged in crosswise layers, soaked in Nile water, beaten, and smoothed; then dried in the sun and pressed flat.

PARAGON—The old name of a size of type, equivalent to two lines of long primer, or approximately 20-point in the American point system.

PARAGRAPH—One or more lines of composition, and usually one or more sentences, placed together; frequently distinguished or separated from other matter by the indention of the first line.

PARAGRAPH MARK—A type character, the most common form of which is this ¶, which is the letter P reversed, the white part being black and the black part white. The mark is used in proofreading and in marking copy for the printer to indicate where a paragraph should begin.

PARALLEL MARK—One of the old-style reference marks, ||, now little used as such.

PARCHMENT—A sheet of writing material made from the skins of young animals, like lambs, sheep, goats, and calves, used by the ancients for books and records; now used primarily for special diplomas and for bindings on some books.

PARCHMENT FINISH—A finish on paper resembling parchment.

PARCHMENT PAPER—A thin, transparent paper, made by specially treating unsized paper having a high rag content; it is used for wrapping of meats, butter, and other fats. *Vegetable parchment* is a similar paper, but is made of vegetable fibers and rags. The name *parchment* is also applied to a class of high-grade printing paper made to resemble real parchment.

PARENTHESIS (plural *parentheses*)—The curved strokes used to enclose a parenthetical word or phrase in composition: ( ).

PASTED STOCK—Bristols, weddings, or other card stock which has been pasted together in two or more thicknesses; known as two-ply, three-ply, four-ply, etc., according to the number of sheets pasted together; pasteboard.

PATENT BLOCKS—A general term, applied to all varieties of bases, usually made of metal, for attaching beveled electrotypes, halftones, or other printing plates. Patent blocks or bases are 0.759 inch high, and the plates to be mounted on them must be 11 points or 0.1522 inch high. Also called *sectional blocks*.

PEARL—A size of type under the old-style nomenclature, approximating 5-point in the American point system. Pearl is smaller than agate and larger than diamond.

PEBBLING—Producing a rough or stippled finish on the surface of paper or card stock by feeding it between steel rollers having the desired pattern on their face.

PERFORATING RULE—Sharp, dotted or hyphen-rule, slightly higher than type, used in conjunction with type, to perforate the paper stock where it is desired to be easily torn off, as in check books, coupons, etc.

PERIODICAL—A publication issued at regular intervals or periods of time, as a magazine, review, or journal.

PHOTO-ENGRAVING—Any photo-mechanical process by which a relief printing plate is produced direct from copy, type, or illustration, as distinguished from photogravure or photo-lithography. See *Halftone* and *Line Engraving*.

PHOTO-GELATIN PRINTING—Any of the gelatin processes of photo-mechanical printing, in which a glass or metal plate, covered with sensitized gelatin or glue,

provides the printing surface. The collotype, albertype, artotype, heliotype processes (which see), and the foreign *lichtdruck, photographie,* etc., are so-called gelatin printing processes.

PHOTOGRAVURE—A print produced by any of the various processes from an intaglio plate. See *Rotagravure.*

PHOTOGRAVURE PLATE—An intaglio or depressed printing plate, etched on copper through a resist, prepared photo-mechanically.

PHOTO-LITHOGRAPHY—The method of making a lithographic picture from a design produced photographically, instead of drawing the design by hand direct on the stone.

PHOTOSTAT MACHINE—A photographic machine which makes a negative directly on a piece of sensitized paper, instead of on a glass plate or film, and then develops and fixes the paper negative inside the machine.

PHOTOSTAT PRINT—A print or picture printed from a photostat negative.

PI—Type which has been disarranged and mixed into a confusing mass.

PICA—A size of type equal to twelve points in the point system. It is the standard of measurement for leads, slugs, furniture, and all other material used in the print-shop, and also the width and length of pages. In Germany, pica or 12-point type bears the size-name of *Cicero.*

PIECE FRACTIONS—Those that are made up of two or more pieces of type, the numerator and denominator being cast separately, usually on bodies half the height of the point-size of the type with which they are to be used. Sometimes called *split fractions.*

PIN-MARK—A small circular depression in the side of the upper part of a type-body, made by a pin in the mold while the type is being cast.

PLANOGRAPHIC PRINTING—The method of printing from plane surfaces, as distinguished from raised or relief plates and from intaglio or sunken surfaces. Lithographic, offset, and gelatin printing are planographic methods.

PLATE—Any metal surface so prepared that printing may be done from it.

PLATE FINISH—A smooth finish made on paper by running it through a super-calendering machine.

PLATEN—The flat metal plate of a platen press which presses the paper against the form and thereby produces the impression.

PLY—A thickness or layer; said of a sheet which is pasted to another, either thin or thick paper; two sheets together are 2-ply; three sheets, 3-ply, etc.

POINT—A unit of type measurement upon which the point system is based. A point is equal to about 1/72 inch, or 0.013837 inch.

POINT SYSTEM—A system of standard type sizes and measurements, originally worked out by M. Jules Simon Fournier, in 1737, but not used in America until the year 1878, and officially adopted by the United Type Founders' Association in 1887. This system is based upon the pica body, which is divided into twelfths or points, and every type-body or size consists of a given number of points (sometimes half-points). Each point is equivalent to 0.013837 inch.

POST—An English size of writing paper about 16 by 20 inches, which derived its name originally from the postman's horn watermark in the sheets. The corresponding size in America is 17 by 22 inches, and is called *folio.*

POST CARD—Any private or unofficial mailing card, not smaller than 2¾ by 4 inches, nor larger than 2¾ by 5 9/16 inches, which is carried through the mails when a postage stamp is attached to it.

POSTAL CARD—A mailing card, 5½ by 3¼ inches in size, on which the postage stamp is printed direct, by the government.

POSTER—A large printed placard or bill, used to post on walls, boards, or to display in store windows, for the purpose of advertising. The standard poster paper size is 28 by 42 inches.

POSTER CHASE—A large chase, without cross-bars, in which type for posters can be locked.

POSTER STICK—A long wooden composing stick, used for poster composition.

POSTER TYPE—Large sizes of type, either of metal or wood, used for poster work. See *Wood Type.*

PRESSBOARD—A hard, strong, highly sized cardboard, of several thicknesses, used on platen (and sometimes cylinder) presses, where a hard packing is needed in the tympan. Also called *press paper* or *leatherboard.*

PRESS FEEDER—A person who feeds the sheets into a press; the automatic device which does the feeding.

PRESSMAN—One who has charge of the operation of a printing press.

PRESS PROOF—A proof taken on a press after the form has been positioned and made ready; it is supposed to show the general appearance of a piece of printing—the imposition, margins, color of ink, etc. If any corrections or changes are needed, they are marked on this proof.

PRESS REVISE—A proof taken of a form on a press for the purpose of seeing that all corrections or changes marked on the press proof have been accurately made; it is the final proof, and it receives the O. K. if correct in every respect.

PRIMARY COLORS—In light they are green, red, and violet (or blue-violet). In printing inks or pigments, yellow, red, and blue are called primary colors.

PRINT—To set type and take impressions therefrom; to make impressions by any other method, as intaglio or lithography, from plates, engravings, etc. The sheet or paper which is printed upon is also called a *print.*

PRINTER—A person who is engaged in the occupation of printing, either as a workman or employer. The word, which is derived from the old French *preinter,* is a very comprehensive term nowadays, and includes all persons in any way connected with the production of printed sheets by the various processes.

PRINTER'S DEVIL—An obsolete term, formerly applied to the errand boy in a print-shop, and also to apprentices.

PRINTER'S MARK—An engraved emblem or device of a printer or publisher, serving the purpose of trademark or imprint.

PRINTER'S OBLONG—A rectangle in which the diagonal line from one corner to another is twice the length of the short side or base. Considered a good proportion for a book page.

PRINTING: THE MOTHER OF PROGRESS—The slogan of the United Typothetae of America.

PRINTING INK—The substance or combination of black or colored pigment, boiled oil, etc., applied to printers' rollers and then transferred to type, engravings, or other

printing surfaces from which an impression is made on paper or other materials of suitable quality.

PROCESS COLOR PRINTING—A method of printing from halftone plates which have been engraved in such a way that two or more colors may be printed on the same sheet, a separate plate being used for each color.

PROCESS ENGRAVING—A general term used to describe an engraving made by photographic, chemical, or mechanical methods, such as halftones, zinc etchings, etc.

PROOF—In printing, an impression taken from any printing surface for the purpose of examination and correction by the author or proofreader.

PROOF PLANER—A wooden planer, the bottom or flat side of which has been covered with felt or thick cloth, used for beating proofs of type forms, which is done by inking the type, placing a sheet of paper on it, and then gently impressing the paper with the planer and a mallet.

PROOF PRESS—A press used primarily for taking proofs.

PROOFREADER—A person who reads and marks proofs for correction. Also called *corrector of the press.*

PROOFREADERS' MARKS—The standard marks or symbols used by all proofreaders to designate the corrections that are to be made in proofs. Commonly called *proof marks.*

PULLING PROOFS—A term applied to taking proofs of a form on a hand press, originally so called because it was necessary to pull a lever on the press in order to make the impression, on dampened paper, and then pull this gently from the type.

PULP—The wet (and also the dry) mass of rag or wood fibers or other cellulose stock which has been beaten and prepared for the paper-making machine.

PUNCH—In type founding, an original die or engraving of the face of a letter or character to be cast. See *Type Founding.*

PUNCH CUTTER—The person who engraves or cuts the punches which are used in making the matrices for casting type.

PUT DOWN—To compose matter in lower-case type, or change letters from upper- to lower-case type. *Put up* means the opposite, and indicates that capitals are to be used instead of lower-case letters.

PYRAMID HEADING—A display head set in half-diamond or inverted pyramid form, used frequently on newspapers.

Q

QUAD—The abbreviated term for *quadrat,* which see.

QUADRAT—Quadrats or quads are blocks of metal less than type-high, cast in half-ems, ems, and two- and three-em lengths. They are used for indentions at the beginning of paragraphs, and to fill the larger white spaces in lines of composition.

QUARTER-SHEET—One quarter of any standard-size sheet, as a quarter-sheet poster (10½ by 28 or 14 by 21 inches).

QUARTO—A sheet of book paper, approximately 19 by 24 inches, also called *medium.* This, when folded twice, making four leaves or eight pages of about 9½ by 12 inches, produces quarto-size pages or books.

QUATERNIONS—Four sheets, each folded once, nested together to form a section of a book. Our word quire is derived from this term.

QUERY—In proofreading or copy-marking it means to inquire further; sometimes indicated by the question mark ? or by *Qy, qy, qu, que.*

QUIRE—Twenty-four (or twenty-five) sheets of paper, usually of the same size and quality, either folded once or unfolded.

QUIREWISE—To impose or print a pamphlet or booklet so that one sheet, when folded, will nest or fit into another.

QUOIN-KEY—A metal device used to operate quoins in locking them up.

QUOINS—Small wooden or metal wedges used for locking up forms in chases, or to hold type-matter securely on galleys.

QUOTATION FURNITURE—Small metal blocks, hollow on one side, used for filling blank spaces in composition and forms.

QUOTATION MARKS—Brief type characters, " "; also produced by turning two commas upside down and by taking two apostrophes, thus: " ". They are used in composition to indicate that the enclosed matter is quoted.

R

RAG PAPER, RAG CONTENT PAPER—Paper which contains a certain proportion of rag stock.

RAISED PRINTING—See *Thermography.*

READER—A proofreader.

REAM—The unit of a certain number of paper sheets, varying according to different standards of measurement. A long ream contains 500 sheets; a short ream 480 sheets, and a printers' ream 516 sheets.

RECTO PAGE—The right-hand or first page of a leaf in a book; the opposite or left-hand page is called *verso.*

REFERENCE MARKS—A character or mark used to attract attention to a note in the margin or at the foot of a page. Superior and inferior numerals, and the asterisk (*), dagger (†), double dagger (‡), section (§), parallel (‖), and paragraph (¶) marks are commonly used.

REGISTER—The exact fitting or correspondence in the position of pages on both sides of a printed sheet; to print two or more colors beside each other, or one over the other, so that they will appear in their proper places.

REGISTER MARK—A point or mark in the plate or printing form, used as an aid to securing perfect register in color-work.

REGISTER SHEETS—Extra printed sheets of the key-form or plate used by pressmen as guides or trial sheets in registering a second or subsequent form.

REGLETS—Thin strips of specially prepared wood, similar to leads, less than type-high, and in various thicknesses, from 6-point up to 36-point, used in poster-work and other large forms. Also used alongside of quoins in locking up forms.

RELIEF PRINTING—Printing which is done from any relief surface, as type, plates, engravings, etc.

REPRINT—Copy for a book or other work which has already been printed, in distinction from hand-written or typewritten manuscript. A second or new edition of any work is called a *reprint edition.*

RETOUCH—To go over a negative, drawing, photograph, or other copy, with pencil, brush, or pen for the purpose of changing or improving the details of a picture, emphasizing some parts and subduing or washing out other parts.

REVERSE PLATE—A printing plate, in which the parts that are usually white appear black or print so that the design shows in white on a black background.

REVISE—A proof taken after corrections have been made.

RING or RING MARK—In proofreading, the changes from original copy are marked on proofs and a circle is drawn around them to indicate that the errors marked are not the fault of the compositor.

ROLLER—A general term for printers' rollers, whether made of composition or metal. The composition roller consists of a metal core around which is cast a pliable or resilient substance made from glue, glycerine, and other materials.

ROLL UP—To spread ink on type or some other printing surface by means of a roller, particularly a hand roller.

ROMAN—The word *roman,* when applied to type-faces, means that the vertical strokes of the letters are upright and not sloping, as are the same elements in italic type. The roman style of type is the common form, and is based on the style of characters used in the stone inscriptions of the Romans.

ROMAN NUMERALS—The characters or letters used in the Roman system of notation. I, II, III, IV, V, etc., are Roman numerals. All numbers may be formed with the following letters: I, V, X, L, C, D, M.

ROTAGRAVURE (rotary photogravure)—The process of intaglio printing, usually on a rotary press, which is done from an etching made on a copper cylinder that revolves in ink. The ink is scraped off the surface by a knife, but is left in the depressed part of the etching, from which the image is printed.

ROUTING—To cut by scooping or gouging the surface of a printing plate, with a machine or tool.

ROYAL—A size of flat writing paper, 19 by 24 inches, originally of English origin.

ROYAL OCTAVO—The page-size of a book, usually 6½ by 10 inches.

RUBBER REDUCTION—In lithography and offset printing, a method of reducing a design or drawing which is on a lithographic stone by stretching a sheet of special rubber over the inked surface of the design or letters, and then allowing the rubber to contract, after which it is offset onto another stone or plate.

RUBRIC—That part of a manuscript or printed book which appears in red ink or coloring matter; it may be a line, a word, or merely an initial.

RUBY—An English size of type, equivalent to agate, or 5½-point, in the American point system.

RULES—Thin pieces or strips of brass, lead, steel, or other metal, made type-high and used for printing lines of various thicknesses. There are many styles of rules, single, double, parallel, dotted, scoring, perforating, etc.

RULING MACHINE—A machine used for ruling or marking lines of various widths and colors on blank paper, for account books, statements, billheads, etc.

RULING PEN—*(a)* A pen for a ruling machine. *(b)* A style of steel pen used by artists and draftsmen for making lines of different widths.

RUN IN—In composition or proofreading, to put sentences or phrases into one paragraph; to set without a paragraph or break.

RUNNING HEAD—A line at the top of a page. It may be the title of the book, the subject of a chapter, or a sub-head which appears on the page. Also called *running title.*

S

SADDLE STITCH—A thread or wire, stitched through the folded back of a pamphlet from the inside to the outside or vice versa.

S. & C.—The abbreviation for *sized and calendered,* a term applied to a smooth finish on paper.

S. & S. C.—The name of a smooth glossy finish on paper, meaning *sized and supercalendered.* Now generally called *super.*

SANS SERIF—Types without (sans) serifs, as the modern copperplate gothics, and the faces used in modernistic typography.

SAW TRIMMER—A general term given to machines for printers and engravers, used for the sawing and trimming of type-slugs, plates, blocks, etc. See Miller Saw-Trimmer, page 100.

SCOTCH ROMAN—The name of a well-known modernized roman type-face, originally cast in Scotland.

SCRATCH COMMA—The mark which was formerly used for a comma. It is still used in proofreading and is made thus: /. Also called *separatrix.*

SCREAMER—A slang name for the exclamation point.

SCRIBE—The manuscript copyists were called scribes; a professional or public penman.

SCRIPT—Type which is patterned after a plain or ornamental style of handwriting.

Script Type.

SECTION—*(a)* A folded sheet of book pages, consisting of one or more signatures, ready to be sewed into its proper place. *(b)* A character used for a reference mark or to show a division in writing or printing.

SECTIONAL BLOCK—See *Patent Blocks.*

SEPARATRIX—A short diagonal stroke used in proofreading to call attention to a mark by its side, and, as its name indicates, to separate the corrections when there are several on a line.

SEPIA—A brown pigment, made from the secretions of the cuttle-fish, or any imitation of this color.

SERIF or SERIPH—The fine lines or strokes on the face of type-letters, which give them their distinctive styles.

SET—*(a)* To compose type. *(b)* The width of the type-character, from side to side.

SEXTODECIMO (16mo)—A size of book, produced by folding a sheet into sixteen leaves or thirty-two pages.

SHANK—The body or largest part of a type-character.

SHEETWISE—A method of imposition and printing in which a different set of pages or form is used for each side of the sheet.

SHIPPING TAG—A printed card or label, cut from tagboard or strong paper, used to attach to bundles, boxes, etc., as a direction or address label.

SHORT CROSS—The short cross-bar of a large chase; the bar lying parallel to the long side of the chase is called the *long cross.*

SHOULDER—The top blank space on a type-body which is not covered by the letter.

SIDE STICKS, FOOT STICKS—Pieces of wood or metal furniture placed at the side or foot of pages in a chase.

SIGNATURE—In book-printing, each printed sheet, part of a sheet, or as many pages as are folded together in one section, is called a signature.

SIGNATURE MARK—In book work, a letter or figure at the bottom of the first page of a signature, to direct the binder in collating or assembling the printed sheets. Signature marks are also of use to the compositor and pressman in identifying the forms and arranging them in proper position on the press.

SILHOUETTE—A portrait, profile, or an outline of any object, represented in black.

SIZE—*(a)* A glutinous substance, made of animal or vegetable fats, used to give stiffness to paper and prevent writing ink from penetrating it. *(b)* A sticky paste used instead of ink in printing sheets which are to be bronzed or gilded. The word sizing is also used as a noun.

SKELETONIZE—To divide or break up lines of type which are to be printed in two colors.

SLICE—*(a)* A thick, wide metal knife for handling ink. *(b)* The removable bottom of a *slice galley* (now obsolete).

SLICE GALLEY—An old-style wooden galley with a sliding bottom, used for transferring large pages of type to the imposing stone.

SLIP-SHEET—To place sheets of paper between freshly printed sheets in order to prevent them from offsetting.

SLITTING—Cutting the paper web at the dry end of the paper-making machine either by rotary or straight knives. Slitting is also done on cylinder presses and folding machines.

SLUG—*(a)* A strip of metal, less than type-high, and five or more points in thickness, used for spacing material in composition. *(b)* A line cast on a composing machine.

SLUR—A blurred impression, or a smear on a printed sheet.

SMALL PICA—The old name of a size of type, equivalent to 11-point in the American point system.

SMASHING—The operation of pressing together the folded signatures of pamphlets or books, in order to smooth out the sheets and flatten the folds.

SODA PULP—Wood pulp which has been prepared by the soda process.

SOFT-SIZED—A slightly sized sheet; having or containing less than the usual amount of sizing.

SOLID MATTER—Type that has been set solid, without leads between the lines.

SORTS—All the characters in the boxes of a case; *out of sorts* means that there is a shortage of particular letters; *runs on sorts* is a term used when the copy calls for more than the usual proportion of any character.

SPACES—The pieces of metal blanks in a type case. Spaces are cast less than type-high and are used to produce the white space between words.

SPACING—Placing the proper amount of material between words, lines, or masses of type.

SPECIMEN BOOK—A book showing various type-faces, issued by a type founder.

SPLIT FRACTIONS—See *Piece Fractions.*

STANDARD SHEET SIZES—Paper sheet sizes that have been adopted as standards by paper manufacturers. See table on page 285.

STANDING MATTER—Type which is kept standing from one printing to another.

STAR—The asterisk (*).

STEEL DIE—A block of fine steel upon the polished side of which a design is engraved in intaglio, used for die-stamping and embossing.

STEEL and COPPERPLATE ENGRAVING—The process of printing from steel or copper plates, the designs on which are incised or cut intaglio.

STEM—The main upright or heavy stroke of a type-letter.

STEREOTYPE—A metal plate, cast in a mold from a papier-mâché or plaster-of-paris matrix, which has been made from a type-form or other relief surface.

STET—A Latin abbreviation. A word written in the margin of a proof when the proof-reader has inadvertently marked out a letter, word or sentence which on second thought he prefers to leave unchanged. The word is derived from the neuter verb *sto,* meaning to stand, to endure, or abide, and signifies *let it stand.* Dots are placed beneath the word in the text which is to remain, although crossed out.

STICK—A common term for the composing stick.

STICKFUL—As much composed type as will conveniently fill a composing stick.

STONEMAN—One who is chiefly employed in imposing and locking up forms.

STONE PROOF—A proof taken of a form or other type-matter while it is still on the imposing stone.

STRAIGHT MATTER—Type composition set in plain, running paragraphs, without display lines or tables.

SUBSTANCE WEIGHTS OR NUMBERS—In paper-making, the basis of weight as determined by the number of pounds to the ream in certain sizes. The standard sizes of various papers upon which substance numbers are based are: Book paper, 25 by 38; writings, 17 by 22; covers, 20 by 26; bristols, 22½ by 28½; papeteries, 21½ by 33 inches.

SULPHATE PULP—Pulp produced from wood by cooking in a solution of sodium sulphite or caustic soda.

SULPHITE BOND—A machine-dried bond paper made of sulphite pulp.

SULPHITE PULP—Pulp made from wood chips cooked in a solution of bisulphite of lime.

SUPER—In bookbinding, a kind of muslin or mull used in the backs of bindings and elsewhere to strengthen them.

SUPERIOR LETTERS OR FIGURES—Small characters cast on the upper part of the type-body, $^{a\ b\ 4\ 3}$, used for references, equations, etc.

SUPER ROYAL—A size of paper, larger than *Royal,* usually 20 by 28 inches in the United States, and 19 by 27 inches in England, although sometimes other sizes are called super royal.

SWASH LETTERS—Letters having extended serifs and added flourishes, found in some fonts of roman and italic types. *A, M, P.*

T

TAB—A protrusion or lip, usually rounded, on an index card or other small sheet, on which figures, letters, syllables, or words are written or printed for quick reference to subjects to which they pertain. See *Pad.*

TABLE—An orderly arrangement of topics and figures in two or more columns; a list, index; a syllabus; a synopsis.

TABLET—*(a)* A pack or collection of sheets of paper, printed or unprinted, glued or stitched at one end only. See *Pad.* *(b)* A flat panel or piece of wood, metal, or stone or other material on which to paint, engrave, draw, etc.

TABULAR WORK—Composition or type-matter consisting chiefly of figures, rules, and leaders, set in two or more parallel columns. See *Table.*

TAG—A label or card for pasting, tying or nailing on packages or cases; a *shipping tag.*

TAG BOARD—A strong yellowish card stock used for shipping tags, labels, covers for blank books, samples, counter sales books, etc. See *Manila.*

TAILPIECE—A small cut or ornament placed at the end of a chapter or at the bottom of a page.

TAKE—When copy is divided among several compositors, each part is called a *take.*

TAKE IN—To reduce the space between words in a line in order to get in an additional word or syllable. To *drive out* is to wide-space and put the word or syllable into the next line.

TEXT—The main or body matter of a page or of a book, as distinguished from titles, headings, notes, extracts, references, indexes, comments, etc. Also applied to written work.

TEXT LETTER—A general term for any style of Old English or Blackletter type, so called because it was used by Gutenberg and the early printers for the text of their books.

TF—An abbreviation which means *till forbidden,* sometimes used on small newspaper advertisements to indicate that the ad is to run until it is canceled.

THERMOGRAPHY—A word employed to describe the product of those printers who produce "engraved effects" or raised printing; also called rosin printing. (Probably from the Greek word, meaning *heat-printing.*)

THIRTY, or "30"—A term used on newspapers, signifying *the end.* Some years ago, the Associated Press news service for morning dailies stopped at 2.30 A.M. For the sake of brevity, when all news matter had been sent over the wire, the word "thirty" or "30" appeared at the end of the last article, and for the composing room it was a signal to close the forms and go to press. The term *Good Night* is often used instead of "30."

THIRTY-SIXMO (36mo)—A size of book determined by folding a sheet, or several sheets, into 72 pages or 36 leaves.

THIRTY-TWOMO (32mo)—A sheet folded into 32 leaves or 64 pages. A size of book established by folding one or more sheets into 64 pages.

THREE-LINE LETTER—A large initial at the beginning of a paragraph, the depth of three lines of text.

TICKET—A card of admission, as a theater ticket; railroad, steamship, street car, and other privilege cards are also called *tickets.*

TILDE—The small curve (~) or diacritical mark on top of the Spanish *n,* and sometimes *l.*

TINT—A light or high value of any color, serving as a background for other colors, or for type-matter.

TINT BLOCK—An engraved, grained or flat plate or electrotype for printing a tint or faint color, either as a background or to fill in panels or other parts of a printed page.

TISSUE PAPERS—All thin, light, gauze-like papers, used either for printing or wrapping purposes, are called *tissues.*

TITLE—The title of a book usually includes a brief description of the subject treated, and also the author's name.

TITLE PAGE—The page at the beginning of a book or other printed work which gives the subject of the volume, together with the author's name, publisher's imprint, date of issue, etc.

TITLE SHEET—The first signature or sheet of a book, which contains the title page and other introductory matter.

TOKEN—The term is now practically obsolete in America, but when used at all, it may indicate about a half-ream of paper. Formerly it meant 240 sheets. *Lift* is the common word in use today. See *Lift.*

TOP SHEET—The uppermost sheet on the cylinder or tympan of a press, usually of heavy manila paper. Also called *draw sheet.*

TOUGH CHECK—A smooth cardboard, tough and pliable, which is manufactured in several weights and colors. It is used for tags, tickets, schedules, etc., where a strong and durable card stock is desired.

TRANSLUCENT—Applied to paper which allows some light to penetrate through it; semi-transparent paper or cardboard.

TURN FOR SORTS—In composition, when any character in the case is missing, but may be provided later, another character of the same thickness is placed in the line face downward, thus: ▬.

TYMPAN SHEET—The sheet of paper, card, cloth, or other material, that covers the platen or cylinder of a press, and on which the unprinted sheet is placed to receive the impression.

TYPE FOUNDING—The casting or manufacture of printing types, including the designing of the faces.

TYPE-HIGH—The height of type, which is 0.918 inch.

TYPOGRAPHY—*(a)* The art and practice of printing from movable types. *(b)* The composition of type as affecting its design and arrangement.

TYPOTHETAE—The United Typothetae of America, or a local branch of the national organization of master printers.

U

UNDERSCORE—To draw or print one or more lines beneath letters or words for emphasis, etc., thus: Underscored or Overscored.

UNDERLAY—A piece of paper, cardboard, or other substance placed under a form, or attached to the bottom, to bring it up to proper height for printing. Underlays are also applied to the wood bases of engravings or electrotypes.

UNIONS—Societies of journeymen printers and others in the same line of work, organized in many cities. The compositors' society is known as the International Typographical Union, having its headquarters in Indianapolis, Ind. Workers in the pressroom are organized in the International Printing Pressmen and Assistants' Union.

V

V—The letter V is the older form of the character U, and for a long time, up to the invention of printing, and some time afterward, V was used interchangeably with U (which was the cursive form of V). V as the equivalent of U is still occasionally used in lettering, as in titles, tables, inscriptions, etc., to give an old-style or classical effect. As a Roman numeral V stands for five or 5.

VEGETABLE PARCHMENT—A specially prepared paper, resembling parchment paper. See *Parchment.*

VELLUM—A kind of material, used instead of paper, made from the skins of calves, of finer quality than the real parchment. Vellum is used mostly for bindings of fine editions of books. *Vellum paper* is made from high-class rags that have been specially treated.

VELLUM FINISH—Paper or cardboard made with a surface that looks like and feels like vellum; the smooth, natural surface of a finely prepared sheet-skin.

VERMILION—A pigment used in making red ink, being the sulphid of metallic mercury; but vermilion is sometimes made from the cochineal insect—a sort of worm-dye. Vermilion in ink will injure copper-faced electrotypes. When printing with certain kinds of red inks it is best to use type-forms or nickel-faced electrotypes.

VERSO—The reverse or back side of a book cover; the left-hand page of a book. See *Recto.*

VOLUME—Originally a roll of parchment or papyrus; a book; a collection of leaves, numbers, or parts bound together to form a book.

W

W—The last letter to be added to our Roman alphabet, being introduced in the eleventh century. The first form of this letter was two V's, thus VV (double u), because V was the original shape of the letter we now call U.

WALL-PAPER PRINTING—Formerly this class of printing was done by hand methods, either from engraved wooden blocks or by means of stencils; some special kinds are still produced in this manner. Ordinary wall-paper, however, is now printed on large cylinder machines. By the side of a large cylinder, which carries the paper, are a number of small cylinders, to which are attached the printing surfaces, the cylinders being geared so as to revolve and print one color after another. Each small cylinder has its own inking apparatus and carries one color, but all colors, perhaps a dozen or more, are printed at one impression. The pigments used for wall-papers are lime-colors and are more like a paste than typographic ink.

WASH DRAWING—A drawing made in sepia, India ink, or transparent colors, in which the colors are washed lightly and evenly over the surface, as with a brush.

WATERMARK—The faintly marked figure, letter, or design in a paper sheet, usually not noticeable except when it is held up to the light. The watermark in paper is formed while the web is still quite moist, by means of a raised design or pattern fastened to the surface of the dandy roll, which passes over the continuous web of paper, and impresses itself upon it. The design appears as a translucent pattern in the dry paper. The watermarks used by early paper-makers have given names to several sizes, as *foolscap, pot, crown, post, elephant,* which were originally English sizes. The use of watermarks has greatly increased in recent years, as they are now equivalent to trade-marks for papers of known quality.

WAX ENGRAVING—A method of making printing plates for maps, charts, diagrams, and other classes of work by the aid of a kind of pantograph machine, which draws the lines in a sheet of wax, from which an electrotype is made.

WIDE MEASURE—Lines of type that are longer than normal in relation to the size of type used. The normal width for 8-point is 12 picas (8 plus half of 8); for 10-point, 15 picas wide; 12-point, 18 picas wide, etc. Lines averaging over twelve words, or an alphabet and a half of lower-case, may be termed wide measure.

WOOD-CUT—A block of wood, upon which a design for relief printing has been cut with a sharp tool; a print made from such a block.

WOOD-ENGRAVING—The art of engraving upon a polished block of wood; a print made from a block of this kind. The design may be drawn with a pencil, or transferred by photography. By means of fine tools, gravers, tint-tools, and chisels of different kinds, the parts to appear white are cut away, leaving the design in raised dots or lines on the surface. The old wood-engravings were of two distinct styles—*blackline* and *whiteline*. The earliest block-prints, like the "St. Christopher," and somewhat later, the illustrations of Caxton in his *Mirrour of the Worlde* (about 1481), are blackline engravings, in which the outline or main strokes of the design consist of black lines. Certain engravings made by Albrecht Dürer, in Germany, and later by Thomas Bewick, in England, are notable examples of whiteline work.

WOOD TYPE—Large types, made of well-seasoned and smoothly polished maple or box-wood, sometimes pine or other wood; much used for posters and bills. The smallest size is 24-point, or two-line pica; larger sizes are 3-line, 4-line, 10-line, 15-line, etc. Wood types are made in a machine equipped with a pantograph apparatus and rapidly revolving cutters or routers. The finishing touches are done by hand. Finally the types are steeped in oil to make them more durable. They should be cleaned with gasoline or kerosene; never water or lye.

WORK-UP—A rising of a space, lead, or the like, in a form while it is being printed, causing a mark on the sheet.

WOVE PAPER—Paper which has a woven appearance on both sides; made on a mold in which the wires are woven together like the threads of ordinary cloth; it does not show distinct wire-marks, as does *laid* paper.

WRONG FONT—A wrong letter or character in a line, caused by mixing different fonts of type; written *wf* on the proof.

X

XYLOGRAPH—An engraving or printing surface produced on wood; a print made from such a plate. See *Wood-Engraving.*

XYLOGRAPHY—The art and process of cutting or engraving the surface of a polished piece of wood block, in order to produce a printing block.

Y

YE (pronounced *the*)—The *y* in this old-time word is a corruption of the Anglo-Saxon ȳ, or *th,* introduced at the time when the Anglo-Saxon alphabet was superseded by the Old English or black-letter symbols, since it bore a considerable resemblance to ȳ.

Z

ZINC ETCHING—A relief printing plate, made on a smooth piece of zinc, through photo-mechanical and chemical operations.

ZINC HALFTONE—Coarse-screen halftones, such as used on newspapers, are etched on zinc instead of copper. The *Quartertone* and *Newstone* are examples. See *Halftone*.

ZINCOGRAPHY—The photo-mechanical process of putting designs on zinc plates for use in letterpress or lithographic printing. See *Lithography* and *Offset Printing*.

A LIST OF BOOKS FOR AUXILIARY READING

The Art of Spacing, S. A. Bartels.

The Invention of Printing in China and Its Spread Westward, T. F. Carter, Ph.D.

Bookbinding, Douglass Cockerell.

Lithography, F. T. Corkett.

Correct Composition, T. L. DeVinne.

Layout in Advertising, W. A. Dwiggens.

Autobiography of Benjamin Franklin.

Modern Type Display, J. L. Frazier.

Commercial Engraving and Printing, C. A. Hackelman.

The Building of a Book, edited by F. H. Hitchcock.

Dictionary of Graphic Arts Terms, Hugo Jahn.

Every-Day Arithmetic, J. E. Mansfield.

A Color Notation, A. H. Munsell.

Master Makers of the Book, W. D. Orcutt.

A History of Printing, J. C. Oswald.

Printing Types, D. B. Updike.

The Practice of Presswork, C. R. Spicher.

Printing Ink, F. B. Wiborg.

History of Wood Engraving, Woodbury.

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